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**HISTORICAL MINING
IN THE
CENTRAL NEVADA ECOUNIT
OF THE
HUMBOLDT-TOIYABE NATIONAL FOREST**

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CHAPTER 1. INTRODUCTION

Reading the landscape tells even the casual observer that mining has played an important role in the lives of the people and the land of central Nevada. Written records reveal that the modern history of mining in the region began in 1862, although archaeological evidence suggests that indigenous peoples may have mined turquoise and other minerals even earlier. Since then, mining has continued to play an important role in central Nevada, but at varying intensities and with periods of ebbs and flows, right up to the present. Regional landscapes are marked with the ruins of buildings, structures, landforms, trash dumps, roads, vegetation patterns, and other physical remains illustrate and contain information about central Nevada's mining history. Many of these physical remains are within the boundaries of the Central Nevada Ecounit of the Humboldt-Toiyabe National Forest, which is responsible for managing those with significant historical values.

The management of historic mining properties in the ecounit involves applying several principles, concepts, and approaches identified within the context of federal and state regulations and guidelines. Developing an historic context for a specific property or group of properties is the first step. The historic context associates the property with a particular time period, geographical place, and historical theme. Several criteria for evaluating whether or not the property is historically significant within the historical context are then applied. Finally, the integrity of the property is assessed to determine whether or not it is still sufficiently associated with its historical context. All of these steps are reviewed in the following chapters. The document begins with an overview of the mining history of the Central Nevada Ecounit.

CHAPTER 2. HISTORICAL OVERVIEW

Historical mining in the Central Nevada Ecounit begins and is established in a time period marked by enormous global changes, described by historian William Robbins (1994: 147) as follows:

By any measure, the late nineteenth century was a remarkably tumultuous period in the development and expansion of worldwide capitalism. The United States itself was in the midst of the frenetic process of industrialization, moving rapidly toward core status among the nation-states of the world, and within a few short decades it would emerge as preeminent among the global capitalist powers. The integrative forces of market capitalism were reaching to the far corners of the globe, including the interior of western North America. Ultimately, around the onset of World War I, the American West was transformed from a region dominated by preindustrial societies to a fully integrated segment of the modern world capitalist system.

By the turn of the century, large scale corporations and monopoly capital controlled most industries in the American West and strongly integrated the region into global markets and the modern world-system. Most commodities harvested in the region were exported with prices set in the global marketplace (Robbins 1994: 180). The mining industry was the leader in bringing about these changes.

Lincoln and Horton (1964) provide a general overview of the mining history of the state of Nevada up to 1964. The history is well summarized by Figure 1, which diagrams the ups and downs of mineral production in the state between 1859 and 1964. For the most part, the mining history of the Central Nevada Ecounit is a microcosm of Nevada's mining history. The following overview, therefore, builds upon Lincoln and Horton's outline, expanding and modifying where necessary to more accurately interpret the ecounit as a specific region in Nevada.

DISCOVERY AND THE FIRST MINING BOOM, 1862-1880

Sporadic and small scale mining took place in what is now Nevada before the expansion of the American state. Archaeological evidence, for example, suggests that indigenous peoples engaged in the mining of turquoise and salt deposits long before the modern era. In the late 18th century, Spanish Franciscan monks, traveling on the old Spanish trail in what is now southern Nevada, mined gold placers, silver lodes, and turquoise. The discovery of the Comstock lode in 1859, however, brought about a new era in the history of mining marked by a systematic and widespread search for gold and silver deposits and the use of industrial technology. Indeed, the Comstock mines developed an industrial deep mining technology that revolutionized mining worldwide. The riches of the Comstock silver mines started a prospecting frenzy that introduced the mining industry to many other places in Nevada. In 1860, prospectors found new silver deposits in the

Esmeralda district in Mineral County and in the Humboldt district in Humboldt County, soon leading to mining rushes in both places. The Reese River strike in 1862 and ensuing rush brought the mining industry to central Nevada (Abbe 1985).

The Reese River strike intensified the search for new ore deposits in central and eastern Nevada and lead to the organization of several new mining districts within the next few years that now fall within the boundaries of the Central Nevada Ecounit (Appendix 1). Of these, however, only a handful yielded a significant production during the time period. The Reese River district, the Belmont district, the Union district, the White Pine district, the Osceola district, the Tybo district, and the Ward district were by far the most productive, each producing metals worth several million dollars. Other mining districts with significant yields during the time period include the Morey district, the Twin River district, the Northumberland district, the Lodi district, the Piermont district, and the Ruby Hill district. The Eureka district lies outside the boundaries of the present study; however, it was the largest producer in the 1870s and served as a magnet for mining-related activities in its hinterland, which does include parts of the Central Nevada Ecounit.

The time period saw the first development of mining-related regional economic and political structures organized around central places. Several first-order central places with large populations and substantial economic and political power emerged in or around the ecounit during the time period, including the towns of Austin and Hamilton with populations of five to ten thousand people. Mining also created several smaller second-order central places in the ecounit, many of which, however, were quite short-lived. They included the towns of Belmont, Treasure City, Shermantown, Grantsville, Ione, Ward, Troy, Ruby Hill, Jefferson City, and Taylor with populations of one to a few thousand. Several third-order settlements with populations of a few hundred grew up throughout the region, along with much smaller hamlets and household clusters of less than 100 residents.

Global capital made significant contributions to the development of mining in the ecounit during this time period. British corporations financed many of the large mining operations in and around the ecounit during the time period. Jackson (1963), for example, documents the critical role of British investment at Treasure Hill in the White Pine mining district. British capital also financed the mining and smelting operations in and around Eureka.

The time period also saw the development of mining-related infrastructure. Railroads played an important role in the development of mining during the period. The completion of the Central Pacific Railroad in 1869 established the first transcontinental railroad line into Nevada. Secondary railroad lines shortly provided railroad connections from Central Pacific railheads to the area of the Central Nevada ecounit. In 1875, the Eureka and Palisade Railroad opened service between the Central Place railhead at Palisade and the town of Eureka. And the Nevada Central Railroad connected the railhead at Battle Mountain to Austin in 1880. Railroads, however, never extended into the heartland of the Central Nevada Ecounit, making transportation a significant obstacle to the development

of mining in the region. In addition to the secondary railroads, several overland roads connected the Central Pacific railheads to mining districts within the ecounit.

The time period saw the development of Comstock-style, large-scale industrial mining technologies in the ecounit. Steam engines powered the large industrial mines. Small-scale, low-power "appropriate" mining technologies, however, also played an important role in mining in the ecounit, mostly powered by windlasses or animal-powered whims. Underground mining intended to recover high grade ore marked period technologies. Placering, however, occurred in a few places on a small scale. The principal minerals mined in the ecounit during the time period were gold and silver, with lead a major product of the lead-silver ores mined in the Eureka and Tybo districts after 1869. Beneficiation technologies during the time period mostly included mechanical crushing with California stamps and chemical processing with Washoe pan amalgamation, Reese River amalgamation, and smelting.

THE LATE NINETEENTH CENTURY DECLINE, 1880-1899

Mining production in the Central Nevada Ecounit declined in the late Nineteenth Century, culminating in the depression of the 1890s. Only the Jackson district (1880) in the Shoshone Mountains was organized during the time period. Osceola was a major producer of placer gold during this period, but greatly curtailed operations by 1900. In general precious metals mining was in a state of disarray in the 1890s. The Panic of 1893 brought with it a depression in the precious metals mining industry, not only because silver lost much of its market when the United States government stopped coining silver dollars but also because most high grade ore had been mined already (Malone and Etulain 1989: 23).

The regional economic and political structures of the Central Nevada Ecounit generally persisted during the time period. Austin dropped greatly in size but continued to be a regional center of economic and political power. Hamilton disappeared as a regional central place. Other mining-related population centers declined. Global capitalization of the region's mines also declined, especially British investors, who gave up on the Treasure Hill mines and mills during the period. Transportation networks, including the railroads, and other regional infrastructure remained more or less in place.

Gold, silver, and lead continued to dominant mining production in the region, but total production of all three greatly declined. Large scale placer mining began in the Osceola District during the 1880s and continued to 1900 using hydraulic and sluicing mining technology. The Osceola Placer Mining Company constructed a large water conveyance system of ditches and flumes (Vanderburg 1936: 168-9).

THE EARLY TWENTIETH CENTURY MINING BOOM, 1900-1918

Nevada mining largely reflected the national and global changes in the mining industry. After a late nineteenth century depression, Nevada's mining industry saw its yield

increase ten times in the first decade of the twentieth century. Much of the increase came from discoveries at Tonopah (1900) and Goldfield (1901), which emerged as early twentieth century centers of mining activity in Nevada (Elliott 1966). Secondary and short-lived booms also occurred in the Bullfrog district in 1904 (Lingenfelter 1986; Ransome et al 1910), Rawhide in 1907 (Lincoln 1923: 151), the Seven Troughs district in 1905 (Lincoln 1923: 216), the and Manhattan district in 1905 (Lincoln 1923: 175). Other mining districts in the state with significant twentieth century production included the Rochester district in Pershing County, organized in 1912 (Lincoln 1923: 213), and the Searchlight district in Clark County, organized in 1897 (Lincoln 1923: 24-25).

Several new mining districts were organized in the Central Nevada Ecounit in the early 20th century, in part instigated by the Tonopah (1900) and Goldfield (1901) strikes and the development of the copper mining industry in the Robinson district around Ely and McGill (Appendix 1). The most productive mining districts during the time period were the Tonopah district (silver) and the Goldfield district (gold) just south of the Toquima Range and Monitor Range, and the Robinson district (copper) in and around the Egan Range and the Duck Creek Range. All three lie outside the boundaries of the Central Nevada Ecounit; however, they exerted enormous influence on mining-related activities in and around their hinterlands or "catchment basins," parts of which do lie within the boundaries.

The western slopes of the Toquima Range were dominated by the large scale placer mining activities taking place in the Round Mountain district and Manhattan district. Both produced high yields of free gold between the first decade of the Twentieth Century and the 1940s, using a variety of technologies ranging from hydraulic monitors to floating bucket dredges.

Copper soon replaced precious metals as the king of the mining industry. The same period also introduced innovations in technology and organization that revolutionized the mining industry. Cyanide milling, for example, made it possible to extract metals from low grade ore previously not possible. Open pit mining using large power shovels spread rapidly throughout the American West. Vertically-integrated corporate organizations introduced economies of scale into the mining industry. The introduction of company towns into the mining industry in the American West helped corporations to more directly manage their labor force (Roth 1992).

World War One played an important role in increasing mining production during the end of the period. The war created a demand for strategic metals and minerals such as copper, tungsten, manganese, and antimony. Both tungsten and antimony deposits occur throughout the Central Nevada Ecounit. Significant tungsten production during this period came from the following districts: Barcelona, Belmont, Jett, Twin River, Washington, Millett, Birch Creek, Lodi, White Pine, Currant, Troy, Cleve Creek, Black Horse, Sacramento, Osceola, Tungsten/Lincoln, Snake, Lexington, and Shoshone. Significant antimony production came from the following districts: Danville, Morey District, Jefferson Canyon District, Barcelona, Twin River, Washington, Big Creek, and Reese River.

The new mineral discoveries and increased market demand for copper shifted the geographical distribution of economic and political power in the ecounit. The towns of Tonopah, Goldfield, and Ely emerged as first-order central places and population magnets. Regional infrastructure developed further. In 1906, the completion of the Nevada Northern Railroad linked Ely and its copper mines and smelters to the Central Pacific railhead at Cobre. The Tonopah and Goldfield Railroad, completed in 1905, connected these towns to the already existing Carson and Colorado Railroad, which made possible rail transportation to Carson City, Reno, and the Comstock. Within a few years, the transcontinental Lincoln Highway penetrated the region and opened up the area to automobile traffic.

Large scale placer mining began at Manhattan, Round Mountain, and Cloverdale during the time period. The introduction of open pit mining with power shovels, first developed in the Mesabi Iron Range in Minnesota and later at the Bingham pit in Utah, greatly changed extraction technology in some places. Dramatic innovations also occurred in beneficiation technology. The time period saw the widespread application of the cyanide leaching process, developed in the 1880s and first used in Nevada by the 1890s. Cyanidation increased gold and silver recovery rates and, therefore, made possible not only the use of low grade ores but also the reworking of old mill tailings to recover lost bullion. Many mills in the ecounit, however, continued to use existing beneficiation technologies. Somewhat later innovations included flotation, especially for processing copper ores. Power technology also changed. Electricity developed as a source of power late in the nineteenth century and began to replace steam engines during the early twentieth century. Large gasoline or diesel engines ran electrical generators at many mines.

The time period was marked by a new episode of global migration into the ecounit. Immigrants from eastern and southern Europe, especially Italy, Greece, Turkey, Serbia, and Croatia, along with Japan and Mexico supplied labor for the large industrialized mining districts such as Ely, Tonopah, and Goldfield. Company towns emerged during the period, along with satellite settlements just outside the new company towns to provide cheap housing, entertainment, and political activities beyond company control. Labor relations in the mining industry created the most dramatic changes in social institutions during the time period. The Industrial Workers of the World and the Western Federation of Miners organized miners in several places, especially in the Ely District, just outside the ecounit, and at Goldfield.

UPS AND DOWNS BETWEEN THE WORLD WARS, 1918-1939

Dramatic swings in mining production, throughout the state of Nevada generally and in the Central Nevada Ecounit specifically, marked the time period between the two world wars. Mining crashed at the end of World War One, following lowered prices and decreased demand for metals, especially for copper, tungsten, manganese, and antimony. By 1924, however, the industry began to revive (Horton 1964: 13). Lessees operated many gold-silver mines in the ecounit. Some new gold discoveries elsewhere in the state,

including Nevada's last gold rush at Weepah in Esmeralda County in 1927, created new excitement that, however, rapidly dissipated. Lessees operated many gold-silver mines in the ecounit during the time period. Gold, silver, copper, lead, and zinc production reached new post-World War One highs by 1929 (Horton 1964: 14). The Tybo District, for example, produced 350 tons of lead-zinc ore per day in 1929. Mining companies planned new gold milling operations at Round Mountain. Copper production once again boomed in White Pine County, mostly from the Ely mine and smelter. Silver prices, however, dropped in 1929, forcing the abandonment of silver mines such as those at Tonopah and Belmont.

The nation as a whole went through a cycle of economic depression and recovery between 1929 and the 1940s. In general, however, the impact of the cycle on regions and localities varied greatly. Mining in the Central Nevada Ecounit crashed during the early years of the Great Depression between 1930 and 1933. Horton (1964: 15) calculated that "the value of mineral production [for the state of Nevada] in 1933 was only one-sixth of that of 1929." The Tybo lead mine, for example, discontinued operations in 1931, and copper production at the Ely operation dropped to less than 40 percent of capacity. In 1934, however, rising gold and silver prices yet again revived the mining industry. Gold emerged as the most productive metal in Nevada and White Pine County as the most productive place. By 1938, however, both gold and silver began once again to decline, threatening another depression. Copper, lead, and zinc production also increased after 1934 and, with the exception of lead, continued to increase to the end of the period.

The Great Depression of the 1930s saw the movement of unemployed urban wageworks and dust bowl migrants into the American West to seek a better life, often by trying their luck at mining. Among other things, the 1930s gold rush brought with it the cheap and low power "appropriate technology" best exemplified by the arrastra. In contrast, however, the phase also saw the introduction of new and more effective technologies for processing complex ores that brought about renewed mining activity at some of the mines in the area.

THE IMPACT OF WORLD WAR II, 1939-1945

The beginning of World War Two reversed the decline in mineral production that started in 1938. By 1940, production of all metals boomed again, especially copper, lead, zinc, tungsten, and manganese. Within the Central Nevada Ecounit, gold placer mining reached a new high in the Manhattan district in 1940. In the same year, however, the last company to rework old tailings with cyanide in the state abandoned operations at Goldfield. The War Production Board issued Order L-208, which limited mining to strategic materials, in 1942, forcing most gold mines in the ecounit to close. One exception was the Manhattan Gold Dredging Company, which was allowed to continue because of the danger of losing the dredge in flooding.

CHAPTER 3. DEVELOPING HISTORIC CONTEXTS

National Register evaluation of historical mining properties begins with developing an historic context. The concept of historic context has two meanings. First of all, an historic context can be understood as an organizing structure for interpreting history that groups information about historic properties that share a common theme, place, and time. Secondly, an historic context can be interpreted as those patterns or trends by which a specific occurrence, property, or site is understood and its meaning within prehistory or history is made clear. The dimensions of time, place, and theme define all historic contexts.

PLACE

The geographical distribution of mineral deposits in large part determines the mining history of the Central Nevada Ecounit. Gold, silver, lead, copper, zinc, antimony, tungsten, and manganese are the principal minerals mined historically in the region. Placer gold deposits occur at Osceola in the Snake Range and in the Toquima Range at Manhattan and Round Mountain. Silver-lead deposits occur in the Hot Creek Range (Morey, Tybo), the Monitor Range (Longstreet, Danville), the Toquima Range (Round Mountain), the Toiyabe Range (Jett), the Shoshone Range (Union, Cloverdale, Jackson, Washington, Reese River), the Paradise Range (Lodi), the Egan Range (Ward), the White Pine Range (White Pine, Currant), the Grant Range (Willow Creek), the Schell Creek Range (Siegal, Silver Canyon, Muncie Creek, Duck Creek, Taylor, Cooper), and the Snake Range (Mt. Moriah, Osceola, Snake, Shoshone, Tungsten/Lincoln). Tungsten deposits occur in the Snake Range (Black Horse, Sacramento, Osceola, Tungsten, Snake, Lincoln, Lexington, and Shoshone districts), the Toquima Range (Barcelona, Belmont districts), the Toiyabe Range (Jett, Twin River, Millett, Washington, Birch Creek districts), the Paradise Range (Lodi district), the White Pine Range (White Pine, Currant districts), the Grant Range (Troy district), and the Schell Creek Range (Cleve Creek district). Antimony deposits occur in the Monitor Range (Danville district), the Toquima Range (Jefferson Canyon, Barcelona), the Hot Creek Range (Morey), and the Toiyabe Range (Twin River, Washington, Big Creek, Reese River districts). Mercury deposits occur at Horse Canyon in the Toiyabe Range, in the Shoshone Range (Union), and in the Toquima Range (More's Creek). Copper deposits occur in the Hot Creek Range (Tybo), the Shoshone Range (Cloverdale, Jackson), the Toiyabe Range (Reese River), the Paradise Range (Lodi), the White Pine Range (Currant, White Pine), the Egan Range (Ward), the Schell Creek Range (Siegel, Silver Canyon, Muncie Creek, Piermont, Taylor), and the Snake Range (Mt. Moriah, Snake, Tungsten/Lincoln).

Historical mining activity in the ecounit focused upon such geographically variable ore deposits and typically is encompassed by mining districts, which were organized by the miners shortly after the discovery of a significant ore body. Mining districts are political units in the sense of being an officially organized place with commonly agreed upon geographical boundaries and rules governing mining practices. They also are landscapes transformed by the activities of mining that may or may not take place within the political boundaries of the district. In most cases mining districts, if deemed historically

significant, are best treated as “historic districts” within the National Register process. Appendix 1 lists the mining districts that occur within the Central Nevada Ecounit. Tingley’s (1992) map of mining districts in Nevada identifies the geographical locations of the districts.

The mountain ranges in the ecounit with a significant mining past include the Monitor Range (4 districts), Hot Creek Range (2 districts), Toquima Range (7 districts), Toiyabe Range (9 districts), Shoshone Mountains (3 districts), Paradise Range (1 district), Egan Range (1 district), White Pine Range (2 districts), Grant Range (3 districts), Schell Creek Range (9 districts), and Snake Range (9 districts). Total mining production varies throughout the ecounit. The ranges with the highest mining production include the Hot Creek Range (Tybo district), the Toquima Range (Jefferson Canyon, Belmont, Manhattan, Round Mountain districts), the Shoshone Mountains (Union district), the Toiyabe Range (Reese River district), the Egan Range (Ward district), the White Pine Range (White Pine district), the Schell Creek Range (Piermont district), and the Snake Range (Osceola district).

Hardesty and Hattori (1982: 20-26) developed a model of land use patterns within individual mining districts that provides another geographical perspective. The model defines five zones that influence human activities. Ore zones contain mine development activities, hydrologic zones contain point or linear sources of water such as springs or streams, gravity center zones are towns or other places that attract human activities, geological zones are areas of mineral exploration, and peripheral zones contain other activities such as ranching that are not directly involved in mining.

TIME

In addition to place, developing an historic context for mining in the Central Nevada Ecounit requires the time dimension. The general time period within which mining properties in the ecounit are historically important (the period of significance) begins with the first major discovery of mineral wealth in 1862 in the Reese River district and extends to the end of World War Two. Within this time frame, however, the mining history of the ecounit can be subdivided into several shorter chronological sub-periods with distinctive patterns of mining activity. These include

- discovery and the first mining boom, 1862-1880
- the late nineteenth century decline, 1880-1900
- the early twentieth century mining boom, 1900-1918
- ups and downs between the wars, 1918-1939
- the impact of World War Two, 1939-1945

In addition, each mining district in the ecounit may have a somewhat different chronology and periods of significance that must be considered in developing appropriate historic contexts for historic mining properties.

THEMATIC CONTEXTS

The recent revision of the National Park Service's thematic framework for prehistory and history (National Park Service 1996) provides a structure for developing contextual themes for the Humboldt-Toiyabe National Forest Central Nevada Ecounit. Eight themes make up the framework: developing the economy, peopling places, creating social institutions and movements, expressing cultural values, shaping the political landscape, transforming the environment, expanding science and technology, and changing role in the world community. Each of these is considered to be an important component of, and which together capture the complexity and meaning of, past human experience. The themes are interconnected and crosscut by the historical building blocks of people, time, and place. They also unfold, and therefore have significance, at the local, state, or national levels.

Within this framework, six themes best illustrate and interpret the mining history of the Central Nevada Ecounit. They include political economy; mining technology; transforming environments; peopling places; social formations, lifestyles, and cultures; and social institutions and movements. Table 1 outlines the themes in more detail.

Table 1: Mining Themes in the Central Nevada Ecounit

I. Political Economy

- 1. Mining's role in the world community
 - development of global economic and political dependency
 - global population movements
- 2. Development of regional economic and political networks
 - development of economic and political power centers
 - development of regional infrastructure (e.g., roads)

II. Mining Technology

- 1. Patterns of mining technology
- 2. Social and cultural context of mining technology
- 3. Mining technology variability and change (e.g., innovations)

III. Transforming Environments

- 1. Environmental context of mining
- 2. Mining landscapes

IV. Peopling Places

- 1. Colonization/migration patterns
- 2. Population dynamics
- 3. Adaptation: coping with new places and people
 - landscapes and climate
 - population encounters and conflicts

V. Social Formations, Lifestyles, and Cultures

- 1. Household formation and variation
- 2. Community formation and variation

- 3. Class, ethnic, and engendered groups and lifestyles
- 4. Cultures, ideologies, and belief systems

VI. Mining-related Social Institutions and Movements

- 1. Voluntary associations (e.g., labor unions, fraternal orders)
- 2. Formal institutions (e.g., schools, local/regional governments, military organizations)

Political Economy

Mining in the Central Nevada Ecounit, first of all, greatly influenced the political economy of the region. In his book Colony and Empire: the Capitalistic Transformation of the American West, historian William Robbins (1994: 84) argues that

Mining had a greater influence on western history (and over a more protracted time) than any other industry. And from an early period it reflected the basic elements of industrial activity elsewhere in North America; the development of urban living patterns, the striking pervasiveness of wageworkers in those growing communities, and a reliance on global markets for capital, prices, and labor. Mining and its vast support network, including its supply and delivery arterials, made the West an integral element of the industrializing Atlantic economy.

Industrial mining in the American West typically followed on the heels of the construction of vast regional and transcontinental railroad networks that could be used for supply and delivery. Specific localities within the American West are microcosms of mining history that reflect variability and change in this more general pattern. The Central Nevada Ecounit of the Humboldt-Toiyabe National Forest is one such microcosm.

How mining affected the ecounit's place in the world community is illustrated both by the development of global economic and political dependency and by global population movements into the region. The history of the ecounit suggests that mining changed the region into a periphery of the modern world-system as early as the 1860s but that the degree of "peripheralization" varied from one place and time to another. First of all, mining typically involves extracting minerals for export out of the region for sale in the world marketplace, one measure of a world-system dependency. Another measure is the extent to which capitalization comes from outside the region. Global capital, especially from Britain and the eastern United States, largely financed mining in the ecounit.

Wallerstein (1979) also argues that the best measure of world-system dependency is the extent to which a peripheral region receives and consumes "essential goods" (e.g., clothing, food) manufactured in core regions of the world-system. The ecounit appears to be well-integrated into the global marketplace by the 1860s but the degree of integration probably varies from one place and time to another. Finally, global population movements also illustrate how mining affected the ecounit's role in the world

community. Several places within the ecounit served as a global population magnet at various times in the nineteenth and twentieth centuries. Mining attracted workers from Europe, Asia, and Hispanic America, as well as from other places in the United States.

Another sub-theme of political economy in the Central Nevada ecounit focuses upon the role of mining in the evolution of regional economic and political networks. Mining played an important role in the development of such networks. What they may have been is suggested by historian Laurence Shoup (1983). He defines three models or "ideal" types of regional economic and political networks with varying degrees of dependency upon the outside world: self-sufficiency, dependency, and metropolitan. In the self-sufficiency model,

people...are self-sufficient, isolated and independent; the area or industry undergoes permanent development; the population reproduces its own labor force...; and society relates closely to and is heavily influenced by the environment. (Shoup 1983: 77).

In contrast the Dependency model portrays people who are dependent upon outside forces and is the polar opposite of the self-sufficiency model. The Metropolitan model, finally, portrays an urban society organized around "powerful, urban based, governmental leaders and entrepreneurial groups" (Shoup 1983: 80) that dominates the surrounding region. The three models provide alternative explanations of regional economic and political networks in the Central Nevada Ecounit.

In general central places are expected to be important in understanding political economies in the ecounit. Central places are political and economic centers of regional settlement systems that are hierarchically organized into two or more tiers of settlements with different sizes, functions, economic wealth, and political power. Cultural geographers show that central places play three key functions or purposes: administration, marketplace trade, and long-distance trade and transportation. County seats such as Belmont or Hamilton are examples of administrative central places that once existed in the ecounit. Central place theory states that central place hierarchies (1) will consist of at least two orders or tiers of settlements, (2) that each tier will be economically and politically dependent upon the next highest order of settlement, and (3) that the geographical location of dependent settlements in relation to higher order settlements depends upon market exchange, transport facilities, and political administration (e.g., Christaller 1966). The geographical arrangement of mining settlements of different orders in central place hierarchies within the ecounit, therefore, should be predictable.

Two useful measures of differences in the political economies of mining districts within the Central Nevada Ecounit are mineral production or yield and population size. Mineral production measures the degree of wealth and economic power. The mining districts with the highest yields in the ecounit at various times include Tybo, Manhattan, Round Mountain, Union, Reese River, Ward, White Pine, and Osceola. Jefferson Canyon and Piermont also had significantly high yields. Population size measures political power.

The largest towns in the Central Nevada Ecounit include Hamilton, Treasure City, Shermantown, Belmont, Austin, Tybo, Canyon City, Manhattan, Grantsville, Ward, and Taylor, all of which reached population sizes of 1,000 or more. Smaller towns of several hundred include Osceola, Jefferson City, Round Mountain, Ione, Geneva, Piermont, and Black Horse.

Mining Technology

Another contextual theme for historical mining in the Central Nevada Ecounit focuses upon technology. The historic mining properties in the Central Nevada Ecounit reflect, among other things, mining technology types, the social and cultural context of mining technology, and technological change.

Mining Technology Types

The physical remains of mining technology reflect variability and change in the tools, activities, and organization of mineral exploration and extraction, ore processing, and mining-related support such as transportation. Some mining sites are the remains of single specialized mining activities such as mineral extraction or processing or a transport facility. Others are engineer-designed mine complexes that integrate all of the activities into a single operation. The Central Nevada ecounit includes all of these types or patterns.

Mineral Exploration and Extraction Technology

Extraction technology includes the tools and work used for mine exploration, mine development, and mine production. Mine exploration includes all activities involved in the discovery of mineral deposits. Examples of historic properties associated with mine exploration are hand-dug prospect pits, power shovel trenches, bulldozer cuts, and rotary drill holes. The next step after discovery is mine development and production, the excavation and removal of the mineral deposits. Examples of historic properties association with mine development and production are placer tailings, dredging ponds, open pit mines, surface vein mines, underground mines, hoisting equipment and architecture (e.g., windlasses, whims, steam engine-powered hoists, hoist houses), power houses, blacksmith shops, and mine waste rock dumps.

The technology of mineral extraction may be either nonindustrial or industrial. Nonindustrial technology, which is cheap and either human or animal powered, typically is associated with small shallow mineral deposits less than 300 feet deep. The methods include “rat-hole” underground mining following an ore body, surface vein mining, small-scale open pit mining, and mining of shallow placer gravels. Industrial extraction technology, on the other hand, is associated with the mining of large mineral deposits more than 300 feet deep. The technology used powerful and expensive engines or other machines run by steam, fossil fuels, or electricity in the everyday activities of underground excavation, haulage, ventilation, drainage, and mine maintenance. Large hoisting engines, pumps, air compressors, blowers, and mechanical rock drills are included.

Mineral Processing

After extraction, the mineral typically must be concentrated and separated from its rock or other matrix using a variety of processing technologies. The technologies, which may be either nonindustrial or industrial, range from simple mechanical concentration to chemical methods such as amalgamation, chlorination, and cyanidation. Examples of the historic properties associated with processing technology include arrastras, mercury retorts, rotary kilns, Scott furnaces, dry washers, sluice boxes, stamp and concentration mills, amalgamation mills, cyanide mills, flotation mills, smelters, mill tailings, slag dumps, and assay houses. After preliminary processing, some minerals are sent to refineries for conversion into a state suitable for industrial use or commercial exchange. Refineries are not expected to be common in the Central Nevada Ecounit, but the Eureka smelters, which lie just outside the boundaries, included refineries. More often, mineral concentrates were shipped to refineries in the Salt Lake Valley and elsewhere.

Mining-Related Support Technology

In addition to adopting or inventing several types of mineral exploration, extraction, and processing technologies, miners also used mining-related tools and equipment. Mining-related transportation, for example, may have included at various times pack animals, animal-drawn wagons, hand-powered ore cart systems, aerial tramways, steam and electric-powered railroads, and trucks. Other mining-related technologies with variants originating either in technology transfer from elsewhere or local innovation included wood harvesting for cordwood and mine timbers, charcoal making, lime making, water engineering, and stone quarrying.

Social and Cultural Context of Mining Technology

Variability and change in mining technology must be interpreted within its social and cultural context. Economic context plays a particularly important role. Several years ago, historian of technology Thomas Hughes (1983) defined the concept of “sociotechnical system” to explain the emergence of modern electrical power. He argued that modern electrical power must be understood within a technological, scientific, economic, political, and social context that defines the system. Thomas Edison, for example, created the system by seeking to supply electrical power at a price competitive with gas (economic), obtain the support of key politicians (political), cut down the cost of transmitting power (engineering), and finding a bulb filament of sufficiently high resistance (scientific). More recently, anthropologist Brian Pfaffenberger (1992) extended the concept of the sociotechnical system to the comparative and cross-cultural study of technology. Following Hughes, he defined the sociotechnical system as “the distinctive technological activity that stems from the linkage of techniques and material culture to the social coordination of labor” (Pfaffenberger 1992: 497). Technique, in turn, is defined as a “system of material resources, tools, operational sequences and skills, verbal and nonverbal knowledge, and specific modes of work coordination that come into play in the fabrication of material artifacts” (Pfaffenberger 1992: 497). The beliefs,

attitudes, and values making up the work culture also plays an important part in the system.

Mining in the Central Nevada ecounit can be usefully conceptualized in a similar way as a technological system that links together techniques (tools, knowledge, operational sequences and skills), material culture, and the social coordination of labor in a distinctive way. Techniques include mineral exploration, extraction, and processing methods. The social coordination of labor includes such things as kinship and camaraderie networks, proprietary capitalism, corporate capitalism, and government mineral policy (e.g., monetary standard).

Within the Central Nevada ecounit, sociotechnical systems of mining range from small-scale preindustrial systems to large-scale engineer-designed mine complexes. The evolution of mining systems in the ecounit, however, do not follow a straight line progression of simple to complex or preindustrial to industrial. Typically, mining districts or discoveries began with limited small-scale and low cost exploration and development by a few individuals using “appropriate” technology. What happened afterwards depended upon complex historical circumstances, including global fluctuations of the prices of minerals, the global availability of capital, technological innovations, the development of railroad networks and other mining-related infrastructure, geological knowledge of the ore body, and the vagaries of individual or corporate mining promotion, schemes, and hype. The Treasure Hill boom in the late 1860s and early 1870s, for example, attracted enough global capital from England and other financial capitals to support large-scale industrial mining for a time. Perhaps the best example is the Eberhardt mine and mill complex linked by a mile-long aerial tramway. Industrial mining on Treasure Hill collapsed by the early 1890s. Several cycles of small-scale preindustrial mining and large-scale industrial mining followed. Leasing of mines became common in the twentieth century, allowing even large mining corporations to mine using small-scale appropriate technology and a only a few individuals. New ore discoveries or a rise in mineral prices or a reduction in transport or power costs could bring about a shift to large-scale industrial mining. Innovations in mining technology such as cyanide leaching or flotation or power dredges also instigated new episodes of mining activity.

Technological Change

How and why such changes in mining technology took place is another key question. In The Evolution of Technology (1988), historian George Basalla proposes that technological change, mining or otherwise, is best interpreted within the framework of Darwinian evolution. Basalla focuses upon the themes of continuity, variation, selection, and cumulative change to explain technological change. Using the same general approach, Hardesty (1988: 112ff) modifies an evolutionary model of adaptation first proposed by Kirch (1980) for interpreting variability and change in mining technology. The model portrays technological change as taking place in three stages. In the first stage, mining technology introduced into a newly organized mining district is poorly adapted with few variants. Rapid diversification in mining technology takes place during the

second stage, reflecting experimentation and innovation in an effort to cope with the new environment. In the third stage, finally, the most successful mining technologies drive out those that are less successful, bringing out a leap to a new level or plateau of adaptation. Any subsequent environmental change, such as a shift in the global market prices of gold or other world-system relationships, instigates a new cycle of technological adaptation.

In general the evolution of mining technology in the Central Nevada ecounit reflects chronological and geographical changes from nonindustrial to industrial mining. Nonindustrial mining technologies are cheap, small scale, and have low power requirements. Industrial mining technologies are expensive, large scale, and have high power requirements. The process of industrialization not only involves expensive and power-intensive mining machines and methods but also the emergence of a class of professional mining engineers and the dissemination of standardized mining knowledge conveyed in scientific and industry literature.

Global technology transfer is another mechanism of variability and change. Mining in the modern world has been a global enterprise from the beginning. By the Sixteenth Century, for example, a standardized mining technology had been developed in Europe that was transferred worldwide by European global colonization. Later, the famous silver mines of Mexico and Peru further developed the technology, which was exported to the American West in the Nineteenth Century. California Gold Rush miners also adopted Chinese pumps, bucket bailers on an endless chain driven by an undershot waterwheel, based upon traditional irrigation technology in south Asia. The deep industrial mining technology developed in the Comstock mines in the 1860s and 1870s was exported globally to South Africa, Australia, and elsewhere. And the capitalization of mining has long been a global enterprise, perhaps best illustrated in the Central Nevada Ecounit by British investment in the Treasure Hill mines in the White Pine district in the 1870s and 1880s (e.g. Jackson 1963). The role of mining in changing the place of the Central Nevada Ecounit in the world community is best exemplified by global patterns of migration, technology transfer, capitalization, economic distribution, and political relations.

The mining sociotechnical system is the context within which the success or failure of technology transfers can be evaluated. In other words, why an existing tool, machine, or knowledge was accepted or rejected depended upon its economic, political, scientific, engineering, social, and cultural context. Some mining technology variants are local innovations rather than technology transfers. Archaeological studies of mines provide data needed for the comparative study of "appropriate technology" on mining frontiers. In the Cortez mining district in central Nevada, for example, the limestone quarries and lime kilns inventoried by surface surveys document an appropriate technology developed to reduce milling costs by using locally available raw materials (v. Hardesty 1986). The Russell lixiviation technology installed at the 1886 Tenabo Mill used lime and sulfur to make calcium sulfide as a precipitator rather than the more expensive, although somewhat more effective, sodium sulfide. Technological variability in mineral exploration, mineral extraction, mineral processing, and mining-related technology such as water engineering and transportation can be found in the ecounit.

Existing literature in the history of technology argues that the principal reasons for accepting or rejecting a technological transfer or innovation are the availability of capital, the size of the firm making the decision to innovate or not, availability of knowledge about the innovation, the extent to which the workforce is unionized, and the physical and sociocultural environment, especially geographical isolation. Of these, the size of the mining company is considered to play the most significant role in accepting or rejecting technological transfers or innovations. Small mining companies, for example, live too close to the margin to take risks, and the “corporate culture” of large mining companies typically prevent risk taking. Moderate-sized companies, on the other hand, being somewhere in between the two extremes, are considered to the most innovative and willing to take the greatest risks with a new mining technology. Janice Wegner’s (1995) study of the mining technology used between 1885 and 1915 at the Croydon goldfield in Australia’s North Queensland, however, found evidence to the contrary. In this case, technology transfers or innovations occurred independently of company size. Wegner’s study suggests that two factors played much more important roles in bringing about technological change: (1) the ability of mining companies to acquire capital and (2) the geological and chemical characteristics of the ore body. The characteristics of the ore body, for example, especially its variability, largely determined the need to develop new or innovative methods for extracting or processing ore.

Transforming Environments

Another theme is the environmental impact of mining technology. In addition to being diverse and abundant, the physical remains of historical mining provide high resolution “historical analogs” of environmental changes taking place in time periods as short as a few months to as long as several years or more (Hardesty 1998). Both written records and mining landscapes record fine-grained local and regional environmental histories of industry-induced environmental change. Mining takes place in small geographically bounded places with ore bodies or other mineral deposits. The processes of mineral extraction and processing involve the use of industrial technologies embedded in complex sociotechnical systems. Sociotechnical systems, however, also must include environmental context. Industrial mining technologies often change the existing environmental scale and boundaries, persistence and predictability, patchiness and grain, and organization. They link together local “micro-environments,” each with independent histories, into regional environmental mosaics with correlated histories. The social and cultural organization of industrial islands create mosaics that reflect land use activities, circulation networks, and settlement patterns.

Mining technology plays an important role in transforming landscapes. Archaeological and other physical remains often document the changes. Hattori and Thompson (1987), for example, show the importance of archaeological data in documenting and interpreting mining-related changes in vegetation patterns. Geoarchaeological, archaeobotanical, and zooarchaeological studies in particular may provide critical information about the evolution of mining landscapes (e.g., Landon 1997). The study of mining landscape transformation is facilitated by the approach to ecological analysis

and interpretation known as historical ecology (e.g., Crumley 1994). Historical ecology focuses upon the decisions and actions of individuals acting within a social and historical context, that uses historical analogs to interpret human-environmental interplay, and that reads landscapes as the cumulative material expression of the historical trajectories.

Peopling Places

Mining in the Central Nevada Ecounit played a major role in the expansion of the American state into areas that had been unoccupied or occupied exclusively by native Americans. For this reason, the historical mining properties of the ecounit provide a material expression of mining-related colonization or migration patterns; population dynamics; and adaptation to new places and peoples, including coping with new landscapes and climates and encounters and conflicts with indigenous populations.

The geographical and chronological structure of mining-related population movement within the ecounit is one key question. Demographic modeling is one approach to finding an answer. Hardesty (1985: 216-218), for example, argues that geographical patterns of colonization and abandonment on mining frontiers in general can be interpreted with the use of models from evolutionary ecology. He illustrates how this can be done with an application of a model based upon the “marginal value theorem” from optimal foraging theory (Charnov 1978). Another related question involves the geography and chronology of mining-related population growth and decline. New mining discoveries are “population magnets.” Likewise, mining towns act as population magnets during boom periods but as dispersal centers during decline and bust periods. Other significant questions about the mining-related demography of the ecounit include geographical and chronological variation in population density, age-sex structure, fertility rates, and death rates.

Perhaps the most basic question about colonization is where the immigrants originated. Mining-related colonization in the Central Nevada Ecounit took place within a global context. Census records show the 1870 population of Shermantown on Treasure Hill, for example, to be mostly native born, but a significant percentage of immigrants came from Ireland, England, and Wales and a few came from China, Mexico, Yugoslavia, Germany, Scandinavia, and France. In contrast, the early twentieth century mining boom brought hundreds of immigrants from eastern and southern Europe, especially Yugoslavia, Hungary, Italy, and Greece, and from Japan to work as wage laborers in many ecounit mining districts.

Yet another problem area explores the processes of adaptation to often exotic environments and people in the places colonized by miners. How the migrants coped with physical problems of survival and wellbeing is one problem area. The Inland Empire (May 25, 1869), for example, relates the following incident on Treasure Hill:

A singular case of frost bite occurred on the Divide between Treasure and Hamilton during the extreme cold of Sunday

night. A jolly fellow, muchly elevated - we are all elevated about nine thousand feet, but he was spiritually elevated - making the journey on that night between the two places, after answering an imperative call, carelessly exposed himself, and upon reaching Hamilton discovered that he was frozen - well, where women could not be. Suddenly sobered by the appalling calamity, he frantically rushed for professional aid, and the medicine man at once applied an abundant poultice of snow. Partial relief was thus given, but it is expected that early amputation will be necessary in order to enable a respectable - chignon. We have heard of weather causing such disasters to brass monkeys, but not to the genus homo. (Cited in Jackson 1963: 49)

Certainly coping with physical limiting factors such as temperature extremes and water availability played an important role in how the migrants adapted to new places in the ecosystem. Domestic architecture, for example, often reflects strategies of adaptation to physical environment.

Another problem area is how mining-related colonists transformed landscapes into their own culture. Migrants typically brought their homelands with them as much as possible. Chinese migrants, for example, often oriented themselves to new places with the traditional cultural principles of fengshui (e.g., Wegars 1993). Likewise, American migrants from the eastern United States imported cultural concepts of landscape that involved planting trees and laying out towns in a grid pattern.

Finally, the mining colonists encountered new people, either indigenous to the area, such as the Shoshone, or migrants like themselves but with different ethnic or biological backgrounds. The encounters often resulted in conflict, including physical violence as well as social and geographical exclusion, and new patterns of social organization. Among other things, the outcomes of population encounters included segregated "chinatowns," extermination of local indigenous populations, confinement to reservations, and culturally-acceptable hostility toward groups with low prestige, power, and wealth. Chinese immigrants in Shermantown at Treasure Hill, for example, found their presence perceived as a threat to the jobs of other ethnic groups. The few Chinese residents of Shermantown were tolerated as long as they restricted their activities to the sale of opium, sulfur matches and firecrackers, or employment in the service sector (White Pine Public Museum 1987: 3). The Telegram, as well as the municipal government, enjoyed poking fun at what to them seemed the strange culture of Asian peoples. The hatred of Chinese immigrants by the general population was only slightly mollified toward other ethnic and racial groups. An "Indian camp" near Shermantown's commercial area was an occasional target of attack on Saturday nights, whenever the saloon's failed to provide sufficient entertainment for the rowdy miners. Among other ethnic groups, the Telegram's only reference to the Mexican community in Shermantown concerned a theft attributed to a member of that group.

Social Formations, Lifestyles, And Cultures

Another theme focuses upon variability and change in mining-related social formations, lifestyles, and cultures. One problem area explores mining-related household formations in the Central Nevada Ecounit. Hardesty's (1992) review identified four types of miners households in the American West: mutual aid households, family households, occupational households, and work groups. In addition, many miners households consisted of only a single person. Members of the households typically engaged in the activities of wage labor, mutual aid, food-related activities such as production and preparation, reproduction and child-rearing, education, recreation, and inheritance. The households varied greatly in size: a single person, small groups of two to five persons, and large groups of 10-20 persons such as in work groups. The age-sex structure of mining households also varied enormously, including adult males only, adult females only, adult males and females only, adult males and females and children, and other combinations. Finally, mining households varied in social organization. Population census records, for example, show kinship entered into the organization of about 30 percent of the households at Shermantown on Treasure Hill, including nuclear families living alone, nuclear families with boarders, and extended families. The majority of the households, however, consisted of unrelated persons living together for purposes of mutual aid, work, or other activities. Both history and adaptation to social and physical environments appear to play important roles in explaining variability and change in mining household formation.

Another problem area focuses upon mining-related class and community formation. One approach to the problem is suggested by sociologist Richard Hogan's (1990) model of class and community formation in frontier Colorado. The model focuses upon the local community and its interplay with national and global capitalists for control of local industrial production. Hogan (1990: 208) portrays economic and political institutions in the mining community "as unstable coalitions representing the short-term interests of various classes that possess both the economic resources and the political organization required to defend their control of a local political economy."

In this view, Hogan attempts to combine boosterism and conflict interpretations of the development of frontier communities in the American West. The boosterism perspective focuses upon the self-interested role of local boosters such as merchants and land speculators. It does not, however, consider the formation of local industrial classes. In contrast, conflict theorists argue that conflicts among local and regional groups play the pivotal role in explaining the evolution of frontier communities. The approach, however, often exaggerates the extent to which conflict and exploitation explains class relations. In many cases, in fact, self-interested classes such as laborers, merchants, and real estate speculators worked together in the formation of local governments to control industrial production. "Carnival" type local governments placing emphasis upon the rights of persons formed when laboring classes were more or less economically independent and politically organized. In contrast, laboring classes dependent upon wages led to the formation of "caucus" type local governments stressing property rights.

Yet another problem area focuses upon the material expression of mining-related social groups. Patterns of consumer behavior often reflects social group identities and relations. Ferguson (1992), for example, illustrates how slaves on Antebellum plantations in the American South actively manipulated material things associated with architecture, foodways, and ritual to create a distinctive cultural identity. In the same sense, "class-consciousness" is a key concept in the industrial community that argues for the use of practices, material things, and symbols in everyday lives that set off one class-defined group from another. Wageworkers in an industrial community, for example, should have practices and material goods that symbolize working class identity in opposition to other social classes.

Social Institutions

Mining towns typically served as geographical centers of a variety of formal and informal social organizations. They included educational institutions (e.g., schools, public libraries), religious institutions (e.g., churches), local and regional governmental institutions (county commissions, town-boards, law enforcement), military installations (e.g., forts), and a variety of voluntary associations such as fraternal organizations (e.g., Masonic, Eagles, and Knights of Pythias lodges), business organizations (Goldfield Business Men and Mine Operators Association), labor unions (e.g., Western Federation of Miners), charitable organizations (e.g., Nevada Federation of Women's Clubs), personal improvement organizations (e.g., literary societies such as Austin's Library Association), recreational organizations (e.g., baseball teams), and reform movements.

The hierarchical economic and political organization of mining-related towns and other settlements largely explains the geographical distribution of social institutions within the Central Nevada ecounit. Large towns not only had the most diverse and politically powerful social institutions but also often served as "hotbeds" for the formation of voluntary associations and reform movements. Such was the case of Austin, Eureka, Tonopah, Hamilton, Ely, and Goldfield, all of which historically exerted strong economic and political influence within the region although sometimes situated outside the existing forest boundaries. Goldfield, for example, established a public school in 1904 and a public library in 1906-7; Presbyterian, Catholic, and Episcopal churches in 1904; Masonic and Eagles lodges in 1905-6; a baseball team in 1904; town-board government in 1905 and county seat in 1907 (Elliott 1966: 48-61). Several labor- and business-related voluntary associations also formed in the town during the 1906-7 labor unrest, including local chapters of the Industrial Workers of the World (IWW) and the Western Federation of Miners (WFM) as well as the Goldfield Business Men and Mine Operators Association (Elliott 1966: 103-144). The labor unrest also culminated in the arrival of federal troops late in 1907.

Within the existing boundaries of the Central Nevada ecounit, however, social institutions are much less visible. In general, the variety and influence of social institutions diminished progressively downward in the settlement hierarchy to smaller towns, satellite settlements, and other outliers. The short-lived town of Shermantown, for

example, established a Masonic lodge and a town-board government. Similar social institutions occurred in the small towns of Belmont, Treasure City, McGill, Manhattan, Round Mountain, Grantsville, Ione, Berlin, Ward (2000 in 1877), Troy, Ruby Hill (2500 in 1878), Jefferson City, and Taylor (1500 in 1883). Many small settlements established schools but few other social institutions, either formal or voluntary associations. Aurum in the Silver Canyon district, for example, a settlement of about 50 people, opened a school in 1881 (Hall 1994: 121).

CHAPTER 4. PROPERTY TYPES

Property types, groups of historical properties that hold in common important physical and/or associative characteristics, link historic contexts with mining-related cultural resources such as archaeological remains or standing buildings and structures. The property types also have the potential to be repositories of information needed to answer important scientific or scholarly questions. Table 2 lists some of the property types associated with each of the themes for the Central Nevada Ecounit.

Table 2: Mining Property Types in the Ecounit

I. Political Economy

- properties associated with global economic and political peripheralization (e.g., British-operated mines)
- properties associated with regional central place hierarchies (e.g., regional settlement-systems, first-order towns)
- properties associated with mining capitalization (e.g., stock exchanges, banks)
- economic distribution properties (e.g., railroads, communication networks)
- economic and political control properties (e.g., courthouses, military installations)

II. Mining Technology

- mineral exploration and extraction properties (e.g., hand-dug prospect pits, bulldozer cuts, dredging ponds, “rat-hole” mines, deep underground industrial mines, open pits)
- mineral processing properties (e.g., stamp mills, Washoe pan mills, Reese River pan mills, cyanide plants, smelters)
- engineer-designed mine complexes
- mining landscapes
- mining-related properties (aerial tramways, railroads, flumes, engine houses, change houses, claim boundary markers)

III. Transforming Environments

- properties associated with environmental impacts (e.g., mining landscapes, smoke control structures)

IV. Peopling Places

- properties associated with colonization (e.g., earliest or “pioneer” residences and settlements)
- properties associated with adaptation (e.g., buildings using local materials or reflecting technologies for coping with local climates or limiting factors)

properties associated with population dynamics (e.g., cemeteries)
properties associated with encounters/conflicts (e.g., battlefields, military installations)
segregated ethnic or racial settlements (e.g., "chinatowns," reservations)
V. Mining-Related Social Formations, Lifestyles, and Cultures
domestic buildings, structures, and landscapes (e.g., residences, outbuildings, yards, orchards)
properties associated with community variation (e.g., regional settlement-systems, company towns)
properties associated with ethnic, class, engendered, or occupational groups (e.g., buildings, structures, and landscapes)
VI. Social Institutions
religious architecture (e.g. churches, joss houses)
educational architecture (e.g., schools)
governmental architecture (e.g., county courthouses)
military architecture (e.g., fortifications, barracks)
voluntary association architecture (e.g., labor union halls, fraternal organization halls)
commemorative structures (e.g., memorials, monuments)

The material expression of property types, however, varies greatly. Table 3 lists some of the more typical features associated with mining properties. How to link such features to property types is the key to evaluating their significance. They usually cannot be "read" in isolation but as part of a group or feature-cluster reflecting different activities or time periods or both. Some geographical clusters of features at mine sites, for example, date to different time periods. In some cases, mining-related features can be interpreted as the scattered remnants of the same technology, such as a stamp mill or a mine hoisting works, a functionally-related group of features sometimes called a feature-system (Hardesty 1988). Finally, mining landscape features often form larger "site-complexes," geographical clusters of mining-related features associated with activities or historical events that are "linked together as part of an overall strategy" (Binford 1983: 117). Individual mines, for example, are often linked together with several other mining sites in the same mining district as part of a general strategy of mining. For this reason, the district as a whole can be interpreted as a mining landscape at a much larger regional scale.

Table 3. Typical Mining-Related Features

industrial refuse scatters and dumps (e.g., slag, ash, lime, cyanide cans, coal/cinders)

domestic refuse scatters and dumps (e.g., food remains, tin cans, glass bottles)
architectural refuse scatters and dumps (e.g., nails, lumber, window glass)
unidentified architectural features (e.g., foundations, retaining walls, leveled-off areas)
landscape features (e.g., landforms)
mine claim markers (e.g., cairns, tin can, pipe, inscriptions)
prospects (hand-dug pits, bulldozer cuts, power shovel trenches, drill holes and pads)
surface mining pits (open pits, trenches)
placer mining gravel/tailings dumps
placer excavation machinery (e.g., scrapers, power shovels, dragline and slackline excavators, hydraulic monitors, dredges)
water conveyance features (e.g., ditches, flumes, reservoirs)
placer beneficiation machinery (e.g., sluices, dry washers, rockers, pans and bateas, long toms, mechanical washing plants)
underground excavation features (e.g., shafts, adits, drifts, stopes, raises, winzes, portals)
hoisting features (e.g., hoist house/foundations, headframes, hoist engines/ mounts, cables, boilers, windlasses, whims)
mine ventilation features (e.g., air shafts, blowers/mounts)
transportation features (e.g., railroads, aerial tramways, ore car tracks, footpaths, roads)
mine support buildings (e.g., offices, storage building, power houses, change houses)
ore storage and transportation features (e.g., ore bins, ore dumps, tipplers, ore chutes)
blacksmithing features (e.g., forge, water barrel)
beneficiation features (e.g., rock crushers, stamp mills, leaching vats, smelting furnace remains, arrastras, patios, Chilean mills, conveyor belts, tailings ponds, placer dikes)
assaying features (e.g., crucible/cupel scatters, slag, firebrick scatters)
workers housing and maintenance (e.g., bunkhouses, cook houses, outhouses/privies, dugouts, tent sites, hearths)

CHAPTER 5. EVALUATING SIGNIFICANCE

The National Register provides criteria and guidelines for evaluating the significance of historical mining properties (e.g., National Register Bulletin 42). Under the National Register criteria, mining properties are significant if they are (a) strongly associated with historical events, patterns, or themes important in local, state, or national history; (b) strongly associated with persons important in local, state, or national history; (c) provide good illustrations of distinctive architectural, engineering, or landscape designs, patterns, styles, or types; or (d) provide information needed to answer important scientific or scholarly research questions. They may be evaluated for significance as a district, as an individual property, or as a contributing or noncontributing property. Both Belmont and Austin, for example, currently are listed as historic districts. The charcoal ovens at Ward and Tybo also are listed as individual properties. Individual properties within a district may either contribute or not to the significance of the district. Contributing properties include those that meet National Register criteria independently or, if not, is associated with the period of significance, adds materially to the qualities that make the district significant, and retains integrity. In general, isolated artifacts, features, and underground mine workings are considered to be noncontributing unless demonstrated otherwise.

CRITERION A

The physical remains of mining in the Central Nevada Ecounit occasionally convey to the present a strong association with an historical event, pattern, or theme important in local, state, or national history. Political economy is a particularly important theme. British and other global capital investment, for example, played an important role in the development of mining in the American West in the last half of the nineteenth century. The mill town of Eberhardt at Treasure Hill in the White Pine mining district is strongly associated with this theme and, therefore, is significant under Criterion A. Mining districts and individual properties associated with high production or yields also are significant under political economy. The highest producing districts in the Central Nevada Ecounit include Tybo, Manhattan, Round Mountain, Union, Reese River, Ward, White Pine, and Osceola, and to a lesser extent, Jefferson Canyon and Piermont. Another measure of Criterion A significance is population size.

CRITERION B

Sometimes the physical remains of mining convey to the present a strong association with the life of a person important in local, state, or national history. Several individuals played significant roles in the history of mining in the Central Nevada Ecounit. They include major capitalists and investors (e.g., Daniel Guggenheim and his brothers, Leland Stanford, George Wingfield, A.L. Siegel), land developers (e.g., E.A. Sherman), politicians (e.g., Key Pittman), civic and labor leaders (e.g., Charles H. Boyer and C.E. Mahoney of the Western Federation of Miners), and mining engineers, metallurgists, and geologists (e.g., Edward Applegarth, Frank Drake, T.E. Eberhardt, Louis D. Gordon, Mark Requa) associated with the political economy, mining technology, and social institutions and movements. Most of these individuals should be significant at the local

level but some achieved national prominence. The physical remains of places where they lived and worked during key times of their careers, such as residences, offices, workplaces, and landscapes, therefore, may be significant under Criterion B.

Archaeological remains such as trash dumps associated with the residences of important persons, although probably not significant by themselves under Criterion B, may contribute to the significance of the larger property, especially if the dump illustrates the distinctive lifestyle of the person.

CRITERION C

More often, however, the significance of the physical remains of mining lies in their ability to illustrate distinctive engineering or architectural or landscape designs, patterns, styles, or types. In the Central Nevada Ecounit, such mining-related designs include ore extraction and beneficiation technologies, aerial tramways, engineer-designed mine complexes, mining landscapes (e.g., Francaviglia 1991), company towns, headframes, change houses, and worker's housing. Distinctive mining landscapes are associated with the themes of transforming environments or mining technology. Important technological innovations or patterns are associated with mining technology. Townsite patterns company towns or land developments are associated with political economy or social formations. And distinctive domestic, commercial, or institutional architecture illustrate political economy, social formations, or social institutions.

CRITERION D

Perhaps most often, however, the significance of the physical remains of mining resides in their use as a repository of historical information needed to answer important scientific and scholarly research questions. In the Central Nevada ecounit, important research questions derive from the themes associated with the historic context, which include political economy, mining technology, peopling places, social formations and lifestyles, and social institutions and movements. The themes can be approached from a variety of explanatory frameworks (e.g., cultural evolution, Marxism, symbolism), each of which defines what specific questions are important and, therefore, what information is significant under Criterion D. For this reason, Criterion D evaluation of historic mining properties requires the development of research designs stipulating the theoretical or interpretive framework to be used, key research questions, and their data requirements (Hardesty 1995).

Some Research Questions

The following research questions suggest what information is important to scientific and scholarly research under each of the themes.

Political Economy

1. How did the rise and fall of mining in the Central Nevada Ecounit affect the region's external economic and political relations within the world community? For example, how

did mining in the Central Nevada ecounit affect the growth and decline of the region as a world-system periphery?

2. How did mining affect the evolution of regional economic and political structures in the Central Nevada ecounit? For example, how do mining settlements and mining districts in the ecounit reflect shifting economic and political power in time and space? How does mining affect the evolution of central place hierarchies in the region?
3. How did mining affect the development of financial structures in the ecounit?
4. How did mining affect the development of regional infrastructure in the ecounit.

The critical data needed to answer these questions include documentary accounts, oral histories, or physical remains of mine architecture, symbols of wealth, power, and prestige such as architecture; demography; transportation networks; marketing networks; regional settlement patterns; physical remains of land development schemes such as townsites, investment fraud schemes such as “salted” mines, and the architecture, building furnishings and layout, and activities of stock exchanges and banks; physical remains of water conveyance systems, transportation systems, telecommunications systems, power systems.

Mining Technology

1. What were the chronological and geographical patterns of variability and change in mining technology in the Central Nevada ecounit? What were the mechanisms of variability and change? (e.g., innovation, transfer, appropriate technology).
2. What was the impact of mining technology upon social formations, lifestyles, living conditions, and culture in the Central Nevada ecounit?

The critical data needed to answer these questions include documentary accounts, oral histories, or physical remains of mineral extraction, mineral processing, and mine support technology.

Transforming Environments

1. What was the impact of mining technology upon the environment of the Central Nevada ecounit?

The critical data needed to answer this question include documentary accounts, oral histories, or physical remains of mining-related landforms, landuse patterns, vegetation and other biotic patterns, hydrologic patterns, circulation patterns, and settlement patterns.

Peopling Places

1. How did mining affect the modern world colonization of the Central Nevada ecounit?
2. What were the chronological and geographical patterns of mining-related colonization in the region?
3. What social and cultural groups colonized the region?
4. What were the chronological and geographical patterns of mining-related population variation and change?
5. What were the key mechanisms of demographic variation and change?
6. What were the chronological and geographical patterns of environmental adaptation following mining-related colonization of the region?
7. What were the consequences or outcomes of social and cultural contact brought about by mining-related colonization the region?

The critical data needed to answer these questions include documentary accounts, oral histories, or physical remains of military, political, and social encounters and conflicts (e.g., battlefields, buildings where treaties were signed, and the consumer behavior of households showing acculturation or the maintenance of cultural traditions or other consequences of cultural contact), miners households, mining settlements, and regional mining settlement patterns.

Social Formations, Lifestyles, and Cultures

1. How did mining-related community formation take place in the ecounit? What varieties of communities emerged in the ecounit, and how were they organized?
2. How did household formation take place in mining communities in the ecounit? What varieties of households emerged in mining communities in the ecounit, and how were they organized?
3. How did the principle of gender affect the organization of mining communities in the ecounit? What were the lifestyles and living conditions associated with the engendered social groups?
4. How did class formation affect the organization of mining communities in the ecounit? What were the lifestyles and living conditions associated with the socioeconomic classes?
5. How did ethnicity affect the organization of mining communities in the ecounit? What were the lifestyles and living conditions associated with the ethnic groups?
6. How did cultures, ideologies, and belief systems (e.g., corporate industrialism) affect the organization of mining communities in the ecounit? How did cultures, ideologies, and

belief systems affect the practice of mining in the ecounit? How do mining landscapes reflect cultures, ideologies, and belief systems?

The critical data needed to answer these questions include documentary accounts, oral histories, or physical remains of ethnic landscapes, symbols expressing ethnic and cultural traditions, and architecture, mining technology, or social formations associated with ethnically or culturally distinctive traditions.

Social Institutions

1. What varieties of formal social institutions emerged in mining communities in the ecounit, and what are their characteristics? What role did formal social institutions play in the organization and activities of mining and mining communities?
2. What varieties of voluntary associations emerged in mining communities in the ecounit, and what are their characteristics? What role did voluntary associations play in the organization and activities of mining and mining communities?

The critical data needed to answer these questions include documentary accounts, oral histories, or physical remains of governmental, educational, religious, and fraternal organizations and their associated buildings and structures in mining settlements.

Evaluating Information Redundancy

The value of historic mining sites in the Central Nevada ecounit as repositories of important archaeological information depends in part upon their uniqueness. To what extent is the mining property an irreplaceable archive of historical information needed in scientific or scholarly research? Some of the answer to this question lies in whether or not the information is redundant, either with existing archaeological information or with information contained in other sources of information about mining history such as documents and oral testimony. The following questions help to evaluate redundancy:

1. How much information is available about the mining property from written accounts or other documents? To what extent do these documents contain information that could address the key research topics?
2. How much archaeological information is available about the historic property type from existing sites in the central Nevada Ecounit? To what extent do these existing mining properties contain archaeological information that could address the key research topics?
3. What is the likelihood that existing examples of the mining property type will be preserved in the future?

CHAPTER 6. ASSESSING INTEGRITY

In addition to significance, integrity also must be considered in evaluating the eligibility of a mining property for listing on the National Register of Historic Places. Assessing integrity involves the application of specific significance criteria to individual mining properties; however, some general guidelines can be identified. To be considered significant, mining-related standing buildings and structures in the Central Nevada Ecounit should retain integrity of association, feeling, setting, workmanship, materials, and design. Location, however, is not an important element of integrity. Miners often moved buildings and structures from one place to another; indeed, some were designed specifically to be portable. The setting of a moved building or structure, however, must be appropriate.

Under Criteria A and B, integrity of association is particularly critical. The mining property must be sufficiently intact to convey “a strong sense of connectedness between mining properties and a contemporary observer’s ability to discern the historical activity which occurred at the location” (National Register Bulletin 42: 21). The major components of the mining system must still be visible in order to retain integrity of association. In addition, under Criterion B, integrity of association should be good enough to judge that the historically important person connected with the property would be able to recognize it as it was during the period of significance.

Design is the key element of integrity for significance under both Criteria C and D. Engineering flow charts often are needed to assess integrity of design at mining properties. In addition, workmanship and materials are important elements of integrity under Criterion C.

Under Criterion D, design and materials typically are the key elements of integrity. In the case of archaeological sites, design refers to the retention of intra-site patterning of artifacts or features. Most mines have multiple occupations, so a key issue of integrity of design is whether or not the archaeological deposits associated with the individual occupations are geographically or stratigraphically separated. Good integrity of design requires clear separation of deposits. Integrity of materials refers to the abundance and richness of artifacts, features, or other physical remains. A key issue of integrity of materials is whether or not site formation processes involved “catastrophic” destruction, such as fire, which would leave the physical remains more or less intact.

LOCATION

Integrity of location refers to the extent to which the example of this property type remains in its original place. The place of mining cannot be moved, but the physical remains of mining-related activities can be. Mine waste rock dumps, for example, retain integrity of location if they remain in the place where they were originally deposited but have lost integrity of location if they have been moved to another place for reprocessing with another technology (e.g., cyanidation). Likewise, mining-related industrial or domestic trash dumps retain integrity of location if they are primary deposits (i.e., still in

the place where they were originally deposited) but have lost integrity of location if they are secondary deposits (i.e., are no longer in the place where they were originally deposited). In addition, mining buildings, structures, and objects (e.g., machinery) are moved frequently from one mine to another but may be still considered to have retained integrity of location if they have been there for at least 50 years (NRB 42: 19-20).

DESIGN

Integrity of design refers to the extent to which the original mining-related engineering or architectural pattern is still visible and readable in the physical remains of the property. Mining-related designs may include the engineering flow chart of a mill, an engineer-designed mine complex, the layout of underground workings, an ore car tramway system, or a designed company town. Good integrity of design requires physical remains with good visibility and good focus. The visibility of an archaeological site is the abundance of physical remains that remain as evidence of, for example, a past human activity, time period, technology, social group, or mindset (Deetz 1977). The focus of an archaeological site is the "readability" of the physical remains, the extent to which they can be interpreted as evidence of, for example, a particular human activity, time period, technology, social group, or mindset (Deetz 1977).

SETTING

Integrity of setting refers to the extent that the surrounding landscape and physical remains of the property retains the characteristics that it had during the period of significance. If the original property was situated in a rural landscape, for example, the existing physical remains of the property should still be surrounded by a rural landscape to retain integrity of setting. Likewise, if the original landscape on which the property was situated was dotted with small scale underground hardrock mines, the presence of a large modern open pit mine, or a modern military installation, on the existing landscape would cause the loss of integrity of setting.

MATERIALS

Integrity of materials refers to the extent to which the original materials have survived in the physical remains of the property. If the supports for an ore car trestle were constructed originally of wood, the same material should exist in the existing structure and should not have been replaced by concrete or another material for the property to retain integrity of materials.

WORKMANSHIP

Integrity of workmanship refers to the extent to which evidence of the original workmanship has survived in the physical remains of the property. To retain integrity of workmanship, for example, the physical remains of a mine that originally used wooden square-set timbering in underground workings should have still visible evidence of that timbering system.

FEELING

Integrity of feeling refers to the extent to which the surrounding landscape and physical remains of the property "evokes" the same emotions from an observer as it did during the period of significance. To use the above example again, if the original property was situated in a rural landscape, the existing physical remains of the property should still evoke the feeling of a rural landscape to retain integrity of feeling. A modern casino or housing development or military installation in the immediate vicinity of the property would evoke an entirely different feeling and cause it to lose integrity of feeling.

ASSOCIATION

Integrity of association refers to the extent to which the physical remains of the property convey a strong connection with the mining activity that originally took place there. To retain integrity of association, the physical remains must have both good visibility and good focus. Evaluating a property's integrity of association, however, requires a broad and holistic perspective of the mining activities represented rather than a judgement of how well preserved the original buildings and structures are. The association between the present and the past may be equally clear in a visible pattern of ruins, archaeological remains, and landscape features such as mine waste rock dumps, road networks, and glory holes.

LITERATURE CITED

Abbe, Donald
 1985 Austin and the Reese River Mining District, University of Nevada Press, Reno.

Angel, Myron (Editor)
 1881 History of Nevada, Thompson and West, Oakland, California.

Bailey, E.H., and D.A. Phoenix
 1944 Quicksilver Deposits in Nevada, University of Nevada Bulletin 38, Reno.

Basalla, George
 1988 The Evolution of Technology. Cambridge University Press, Cambridge.

Christaller, W.
 1966 Central Places in Southern Germany. Prentice-Hall, Englewood Cliffs, New Jersey.

Crumley, Carol L. (Editor)
 1994 Historical Ecology: Cultural Knowledge and Changing Landscapes, School of American Research Press, Santa Fe, New Mexico.

Deetz, James
 1977 In Small Things Forgotten, Doubleday/Anchor.

Dubofsky, Melvyn
 1985 Industrialism and the American Worker 1865-1920, Second Edition. Harlan Davidson, Arlington Heights, Illinois.

Elliott, Russell R.
 1966 Nevada's Twentieth-Century Mining Boom, University of Nevada Press, Reno.

Hall, Shawn
 1981 A Guide to the Ghost Towns and Mining Camps of Nye County, Nevada. Dodd, Mead Company, New York.
 1994 Romancing Nevada's Past, University of Nevada Press, Reno.

Hardesty, Donald L.
 1985 "Evolution of the Industrial Frontier." In The Archaeology of Frontiers and Boundaries, edited by Stanton Green and Stephen Perlman, pp. 213-229. Academic Press, New York.
 1988 The Archaeology of Mining and Miners: A View from the Silver State. Special Publication Number 6, Society for Historical Archaeology.

1992 "The Miner's Domestic Household: Perspectives from the American West." In Toward a Social History of Mining in the 19th and 20th Centuries, edited by Klaus Tenfelde, pp. 180-196. Verlag C.H. Beck, Munich, Germany.

1994 "Class, Gender Strategies, and Material Culture in the Mining West." In Those of Little Note: Gender, Race, and Class in Historical Archaeology, edited by Elizabeth M. Scott, pp. 129-145. University of Arizona Press, Tucson.

1998 "Industrial Archaeology and the Environment." Paper presented at the 1998 annual conference of the Society for American Archaeology, Seattle, Washington.

Hardesty, Donald L., Stephen Mehls, and Edward Stoner

1994 Data Recovery at the Riepetown Townsite, White Pine County, Nevada. 1994. Report Prepared for Magma Copper Company, Tucson, Arizona, by Western Cultural Resources, Inc., Boulder, Colorado.

Hattori, Eugene, and Marna Ares Thompson

1987 Using Dendrochronology for Historical Reconstruction in the Cortez Mining District, North Central Nevada. Historical Archaeology 21(2): 60-73.

Hogan, Richard

1990 Class and Community in Frontier Colorado, University Press of Kansas, Lawrence.

Jackson, W. Turrentine

1963 Treasure Hill, University of Arizona, Tucson.

Kirch, Patrick

1980 "The Archaeological Study of Adaptation," Advances in Archaeological Method and Theory, Volume 3, edited by Michael Schiffer, pp. 101-156, Academic Press, New York.

Koschmann, A.H., and M.H. Bergendahl

1968 Principal Gold Producing Districts of the United States. U.S. Geological Survey Professional Paper 610, Washington, D.C.

Kral, Victor E.

1951 Mineral Resources in Nye County, University of Nevada Bulletin 45 (3), Geology and Mining Series, Number 50.

Landon, David B.

1995 "The Place of Environmental and Ecological Approaches in a Post-Processual Archaeology," Paper Presented at the 1995 Annual Meeting of the Society for Historical Archaeology, Washington, D.C.

Lincoln, Francis C.

1923 Mining Districts and Mineral Resources of Nevada, Nevada Newsletter Publishing Company, Las Vegas.

Lincoln, Francis C. And Robert Horton C.

1964 Outline of Nevada Mining History, Nevada Bureau of Mines, Report 7, Reno.

Lingenfelter, Richard E.

1986 Death Valley and the Amargosa, University of California, Berkeley.

Malone, Michael, and Richard Etulain

1989 The American West, University of Nebraska Press, Lincoln.

McGuire, Randall, and Robert Paynter (Editors)

1991 The Archaeology of Inequality, Basil Blackwell, Oxford.

National Park Service, U.S. Department of the Interior

1996 Revision of the National Park Service's Thematic Framework, Washington, D.C.

National Register Bulletins (NRB)

n.d. Bulletin 30: Guidelines for Evaluating and Documenting Rural Historic Landscapes, National Register of Historic Places, National Park Service, Washington, D.C.

n.d. Bulletin 42: Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties, National Register of Historic Places, National Park Service, Washington, D.C.

Paynter, Robert

1988 Steps to an Archaeology of Capitalism. In The Recovery of Meaning, edited by Mark Leone and Parker Potter, pp. 407-433. Smithsonian Institution, Washington, D.C.

Ransome, F., W. Emmons, and G. Garrey

1910 Geology and Ore Deposits of the Bullfrog District, Nevada, U.S. Geological Survey, Bulletin 407, Washington, D.C.

Robbins, William

1994 Colony and Empire: The Capitalist Transformation of the American West, University Press of Kansas, Lawrence.

Roth, Leland M.

1992 Company Towns in the Western United States. In The Company Town, Architectural and Society in the Early Industrial Age, edited by John S. Garner, pp. 173-205. New York: Oxford University Press.

Stager, Harold K.

1977 "Mineral Deposits," In Geology and Mineral Deposits of Lander County, Nevada Bureau of Mines and Geology Bulletin 88, Reno.

Tingley, Joseph

1992 Map of Mining Districts of Nevada. Nevada Bureau of Mines and Geology, Reno, Nevada.

1998 Mining Districts of Nevada, Second Edition. Nevada Bureau of Mines and Geology Number 47, Reno, Nevada

Winthrop, Kathryn, and Ann Chambers

1988 Poor But Not So Poor, The Depression Era in Western Siskiyou County, California. Report Prepared for the Klamath National Forest, Yreka, California.

Zanjani, Sally

1988 Jack Longstreet. Ohio University Press, Athens.

Zeier, Charles

1993 "Not by Bones: Exploring Household Composition and Socioeconomic Status in an Isolated Mining Community." Historical Archaeology 27 (4).

APPENDIX 1
MINING DISTRICTS IN THE CENTRAL NEVADA ECOUNTY

TONOPAH RANGER DISTRICT

Mining District	USGS 7.5" Quad	Mountain Range	Important Minerals ⁱ	Discover Date	Producing Periods	Total Yield \$
Hannapah	Hannapah	Monitor	AgAu	1902	1905-7 1915 1919-21 1927-29	unknown
Longstreet	McCann Canyon	Monitor	AuAgPbZn	early 1900s	1900s-20s 1929-31	unknown
Danville	Danville	Monitor	AgPbSb	1866	1866-84 1909-14 1944-46	\$43,000
Morey	Morey Peak	Hot Creek	AgAuPb	1865	1869-73 1880s-91 1921-23	\$463- \$475,000
Tybo	Hobble Canyon	Hot Creek	AgPbAuCu	1865	1867-81 1906-08 1912-22 1926-37	\$9.8 million
Moore's Creek	Jet Spring	Toquima	AuAgHg	unknown	unknown	unknown
Jefferson Canyon	Jefferson	Toquima	AgAuSb	1866	1874-79 1908 1917-19 1928	\$1.5 million
Barcelona	Jefferson	Toquima	AgHgAu	1865-67	1874-77 1921-22	unknown
Belmont	Belmont West	Toquima	AgAu	1865	1865-87 1914-22	\$15-16 million
Manhattan	Manhattan	Toquima	AuAg	1866	1866-69 1905-20s 1939-46	\$12 million
Round Mountain	Round Mountain	Toquima	AuAgPbW	1905	1906-57 1970s-90s	\$10 million
Jett	Pablo Canyon Ranch	Toiyabe	AgPb	1875	1880-91 1920s-25	unknown
Horse Canyon	Dry Canyon	Toiyabe	Hg	1937	1937-45	unknown
Twin River	Tierney Creek	Toiyabe	Ag	1863	1863-68 1918-20s	\$750,000
Millett Union	Tierney Creek Grantsville Ione	Toiyabe Shoshone	Ag HgAuAgPb	1906 1863	1906-16 1863-67 1870 1877-90s 1898-1907 1909-57	unknown \$3.3 million

Cloverdale	Cloverdale Ranch	Shoshone	AgAuPbCu	1905	1905-19	Unknown
Ellendale		Monitor	Unknown	unknown	unknown	Unknown
Spencer Hol						
Spring		Hot Creek	Unknown	unknown	unknown	Unknown
Gabbs		Paradise	Unknown	unknown	unknown	Unknown
Fairplay		Paradise	Unknown	unknown	unknown	Unknown
Paradise Peak		Paradise	Unknown	unknown	unknown	unknown

AUSTIN	RANGER	DISTRICT				
Jackson	Gold Park	Shoshone	AuAgPbCu	1864	1880-1921	\$1 million
Dobbin	Dobbin	Monitor	AgAu	unknown	unknown	
Summit	Summit					
Washington	Brewer Canyon	Toiyabe	AgPb	1860	1863-65 1870-72 1918-22 1930s-37	unknown
Kingston	Kingston	Toiyabe	AuAg	1864	1864-70 1881-86 1906-11	unknown
Birch Creek	North Toiyabe Peak	Toiyabe	AuAg	1863	1863-68 1916-21	\$100,000
Big Creek	North Toiyabe Peak/ Bunker Hill	Toiyabe	SbAg	1863	1863-67 1890-98 1907-22 1937-58	\$500,000+
Reese River	Austin	Toiyabe	AgAuPbCu	1862	1862- 1990s	\$50-65 million
Northumberla nd	Northumberla nd Pass	Toquima	Ag	1866	1866-70 1875-81 1885-86 1908-17 1939-42	\$459,000
Lodi	Ellsworth	Paradise	AgAuPbCu	1863	1863-71 1874-80 1905-28	\$810,000

ELY	RANGER	DISTRICT				
Ward	Ely	Egan	AgPbCu	1872	1872-85 1906-20 1930s 1960s	\$7 million
White Pine	Treasure Hill/ Seligman Cn Mt. Hamilton Green Spg. Hamilton	White Pine	AgPbCuAu	1865	1865-70s 1886-1905 1920s 1970s-80s	\$22 million
Currant	Currant Summit	White Pine	AuPbCu	1914	1914-16 1939-42	unknown
Troy	Troy Canyon	Grant	AgAu	1867	1867-76 1908-15 1936-49	unknown
Willow Creek	Nyala	Grant	AuAgPb	1911	1911-14 1917-22 1927-28	\$50-100,000
Quinn Canyon	Badger Gulch	Grant	fluorspar	unknown	unknown	unknown

Siegel	Silver Canyon	Schell Creek	AgPbCuAu	1871	1871-74 1881 1903-08	unknown
Silver Canyon	Silver Canyon	Schell Creek	AgPbCuAu	1869	1869-73 1878-84 1887-1906 1914-20	unknown
Ruby Hill	Silver Canyon	Schell Creek	Ag	1871	1871-73 1880s 1892-95 1923-28	\$200,000
Muncie Creek	Kalamazoo Creek	Schell Creek	ZnCuPbAg	1860s	1872-90s 1908-12 1919-23 1937	unknown
Piermont	North Schell Peak	Schell Creek	AgAuCuPb	1869	1870-73 1920-36	\$2.5 million
Duck Creek	Duck Creek Valley	Schell Creek	PbAgCu	1905	1905-21	\$164,000
Cleve Creek	Cleve Creek /South Schell Peak	Schell Creek	WAuAg	1923	1923-26 1951-56	\$15,000
Taylor	Conners Pass	Schell Creek	AgPbSbCu	1872	1872+ 1880-89 1918-1961	unknown
Cooper	Majors Place	Schell Creek	PbAg	unknown	unknown	unknown
Mt. Moriah Black Horse	Mt. Moriah Sacramento Pass	Snake Snake	PbZnAgCu AuAg	unknown 1906	unknown 1906-13 1933-54	unknown \$1 million
Sharp	Adovan Wadsworth Ranch	Grant	Unknown	Unknown	Unknown	unknown
Osceola	Sacramento Pass	Snake	AuAgPbW	1872	1872+ 1877-1900 1925-32 1940s-50s	\$3.3 million
Tungsten/ Lincoln Snake Lexington	Wheeler Peak	Snake	WAg	1869	1910-17	\$704,000
	Kious Spring	Snake	WPbCuAg	1869	1913-16	unknown
	Arch Canyon	Snake	WAu	1870	1870-72 1917-18 1941-42	\$80-100,00
Shoshone	Minerva Canyon	Snake	WPbAgAu	1869	1870s-90s 1915-50s	Unknown
Nevada	Cave Creek Comins Lake	Schell Creek	Unknown	Unknown	Unknown	Unknown

TONOPAH RANGER DISTRICT

Monitor Range

Hannapah (Silverzone, Volcano) District

Location: Nye County, USGS Hannapah

Minerals: Silver, copper, gold, mercury

Discovery Date: 1902

Production History: first years of production from 1905 to 1907, during which the camp of Hannapah grew up and died. Another short-lived boom took place in 1915, associated with the Bannock property and the camp of Volcano. Other periods of activity in the district were 1919-1921 and 1927-1929. The name Silverzone came into use in the 1920s.

Total Yield: unknown but probably small

References: Hall 1981: 49-50; Lincoln 1923: 170; Tingley 1992, 1998: 38.

Longstreet District

Location: Nye County, USGS McCann Canyon, Georges Canyon Rim, Saulsbury Basin, Big Ten Peak East, Antelope Spring, Big Ten Peak West

Minerals: gold, silver, lead, zinc

Discovery: 1903

Production History: After its discovery, Jack Longstreet and a few others periodically worked at the mine. A short-lived boom took place in 1929-31, during which time a 100-ton cyanide mill was built. Fresno may have been the original name of the district.

Total Yield: unknown but probably small

References: Hall 1981: 66; Kral 1951: 99-102; Tingley 1992, 1998: 46; Zanjani 1988: 117, 135-36.

Danville (Chloride) District

Location: Nye County, USGS Danville, Fish Spring, Green Monster Canyon, Upper Fish Lake, Barley Creek, Elkhorn Canyon, Eagle Pass

Minerals: Silver, gold, antimony

Discovery: 1866

Production History: The earliest production took place from 1866 to 1881 and during the years 1883-1884, during which time the townsite of Danville grew up. Another period of production occurred between 1909 and 1914. The last production period was 1944 to 1946, during which most of the total yield of the district was produced. Most of the production came from the Sage Hen Mine and the Boston Mine.

Total Yield: \$43,000

References: Angel 1881: 516-517; Hall 1981: 33-34; Kral 1951: 53; Lincoln 1923: 166; Tingley 1992, 1998: 25.

Ellendale District

Location: Nye County, USGS Yellow Cone, Stone Cabin Ranch SW, Mud Springs

Minerals: gold, silver, copper, titanium, barite

Discovery: 1909

Production History: active from 1909 to 1915 and 1938 to 1939.

Total Yield: unknown but probably small

References: Tingley 1992, 1998: 30.

Hot Creek Range

Morey District

Location: Nye County, USGS Morey Peak, Moore's Station, Moore's Station SW, Hobble Canyon

Minerals: Silver, gold, lead, antimony, tin, uranium

Discovery: 1865, organized 1866

Production History: The district was not active until 1869, when the town of Morey was established. Early production took place between 1869 and 1873. The town of Morey reached its peak population size of 95 in 1873, when a 10-stamp mill was constructed. Decline followed shortly thereafter. The district experienced a revival from the early 1880s to 1891. Another period of production took place between 1921 and 1923.

Total Yield: \$462,972-\$475,000

References: Hall 1981: 76; Lincoln 1923: 178; Tingley 1992, 1998: 50.

Tybo (Hot Creek) District

Location: Nye County, USGS Hobble Canyon, Little Fish Lake

Minerals: Silver, lead, zinc, gold, antimony, copper, barite

Discovery: The northern or Hot Creek section of the district was discovered by Native American in 1865 and shown to prospectors in 1866. The southern or Tybo section of the district was discovered in 1870.

Production History: The original district was named Empire. Lincoln (1923: 195) states that the Tybo district for a number of years “produced large quantities of silver and lead ... and was the most prosperous district in Nye County.” The earliest production took place in the northern or Hot Creek section of the district in the late 1860s. Miners built two 10-stamp mills in 1867 and established the town of Hot Creek, which reached a peak size of about 300 in 1868 and survived until 1881. The district revived after the discovery in the southern or Tybo section and produced actively between 1874 and 1881. During this time, the town of Tybo grew up, reaching a peak size of 1,000 by 1876 and surviving until 1911. In addition, mining companies constructed a lead smelter in 1874, a lead smelter and a 20-stamp mill in 1875, and a crushing and roasting mill in 1879. The district declined by 1881 after producing about \$1 million since 1867. Three periods of revival followed, the first between 1906 and 1908. During the next revival period, 1912-1922, mining companies built a 75-ton concentrator in 1917 and added a lead smelter and flotation facility in 1919. Finally, the third revival took place between 1926 and 1937. The time period saw the construction of a 350-ton concentration plant and a new lead smelter in 1929, along with a large two-story boardinghouse for workers and several prefabricated houses for management.

Total Yield: \$9.8 million

References: Hall 1981: 131-135; Lincoln 1923: 195; Tingley 1992, 1998: 74.

Spencer Hot Spring District

Location: Nye County, USGS Spencer Hot Spring

Minerals: tungsten, molybdenum, copper, silver

Discovery: 1941

Production History: The Linka tungsten mine is the major mine in the district.

Total Yield: unknown
 References: Tingley 1992, 1998: 69.

Toquima Range

Moore's Creek

Location: Nye County, USGS Mt. Jefferson, Cravers SE
 Minerals: gold, silver (?), mercury (?)
 Discovery: unknown
 Production History: unknown
 Total Yield: unknown
 References: Tingley 1992: 50.

Jefferson Canyon District

Location: Nye County, USGS Jefferson, Round Mountain
 Minerals: silver, gold, antimony
 Discovery: 1866, key discovery in 1873
 Production History: The earliest period of production took place between 1874 and 1879, with \$1.5 million produced during the peak years of 1875 and 1876. Miners established Jefferson City in 1874 and abandoned the town by 1879. Mining companies built a 10-stamp mill in 1874 at the Jefferson Mine and another smaller mill at the Prussian Mine. The district declined in 1879. Three periods of revival followed. In 1908, a 100-ton mill was constructed, but the revival didn't last out the year. Another revival took place between 1917 and 1919, during which time the 1908 mill was reequipped with flotation equipment and a cyanide tank. The third revival occurred in 1928.
 Total Yield: more than \$1.5 million
 References: Hall 1981: 56-57; Lincoln 1923: 171-172; Tingley 1992, 1998: 41-42.

Barcelona District

Location: Nye County, USGS Jefferson, Corcoran Canyon
 Minerals: silver, mercury, gold, lead, antimony, tungsten, moly, copper, zinc, uranium
 Discovery: 1865 or 1867, organized in 1875
 Production History: The earliest production took place between 1874 and 1877. Mexican miners established the town of Barcelona in 1874, the same year that it reached its peak size of 175. The district declined in 1877. A revival occurred between 1921 and 1922, when mining companies built a 10-stamp mill and a flotation plant.
 Total Yield: unknown
 References: Angel 1881: 519-522; Hall 1981: 10-11; Lincoln 1923: 160-161; Tingley 1992, 1998: 13.

Belmont District

Location: Nye County, USGS Belmont West, Belmont East

Minerals: Silver, gold, lead, copper, mercury, tungsten, turquoise, titanium

Discovery: 1865, organized as the Philadelphia district in 1865

Production History: The earliest and major period of production took place between 1865 and 1887. By 1867, miners established the town of Belmont, which reached a population size of at least 2-4,000 in 1867 and was the county seat of Nye County between 1867 and 1905. During the early period of production, mining companies constructed six mills, including a 10-stamp mill in 1866, a 20-stamp mill in 1867, and a 40-stamp mill in 1868. Production ended in 1887. A revival took place in 1914 and lasted until 1922. During the period, mining companies built a 10-stamp and 100-ton flotation mill in 1915 and a 30-ton cyanide mill in 1921 for reprocessing old mill tailings.

Total Yield: \$15-16 million

References: Angel 1881: 519-522; Hall 1981: 14-20; Lincoln 1923: 160-161; Tingley 1992, 1998: 14.

Manhattan District

Location: Nye County, USGS Manhattan, Belmont West, Baxter Spring, Seyler Peak, Big Ten Peak West

Minerals: gold, placer gold, silver, antimony, As

Discovery: 1866, organized in 1867, new gold discoveries in 1905

Production History: The earliest hardrock production in the district began in 1866 and lasted until 1869. New discoveries in 1905 started a major revival that lasted until the 1920s. Placer mining began in 1906 and reached peak production between 1909 and 1915. During this period, the town of Manhattan grew up and reached a population of 1,000 by the 1910s. A 75-ton mill was built in 1912 and modified in 1915 to include roasting furnaces. Production mostly ended in the 1920s. The district revived between 1939 and 1946, when a 3,000 ton dredge operated.

Total Yield: \$12 million

References: Hall 1981: 66-72; Lincoln 1923: 175-177; Tingley 1992, 1998: 47.

Round Mountain District

Location: Nye County, USGS Round Mountain, Cravers SE, Manhattan

Minerals: gold, placer gold, silver, tungsten, lead, mercury, uranium, arsenic, titanium

Discovery: 1865 and organized in 1865; other discoveries from 1901 to 1906, placers and tungsten in 1907

Production History: The earliest hardrock production began in 1906, followed by placer mining in 1907. The Round Mountain Mining Company built a mill in 1907 and an extensive water conveyance system for hydraulic mining between 1907 and 1915, bringing water first from Shoshone Canyon and Jefferson Canyon and later from Jett Canyon. Miners established the townsite of Round Mountain in 1906, which soon reached a population size of 400. After the discovery of tungsten in 1907, miners built a tungsten mill in 1911. Production in the district continued with cycles of high and low yields until 1957. Another period of production began in the 1970s and continues to the present day.

Total Yield: \$10 million

References: Hall 1981: 106-109; Lincoln 1923: 180-181; Tingley 1992, 1998: 62.

Toiyabe Range

Jett District

Location: Nye County, USGS Pablo Canyon Ranch, Seyler Peak, Toms Canyon, Carvers, Dry Canyon, Arc Dome, Bake Oven Creeks, Farrington Canyon

Minerals: antimony, mercury, silver, lead, copper, tungsten

Discovery: (1864 or 1865?) 1875, organized 1876

Production History: The earliest production took place between 1880 and 1891. Miners established the town of Jett in 1880, which survived until 1891, when the district declined. The district revived in the early 1920s, when a new settlement and a boardinghouse were built, and production lasted until 1925.

Total Yield: unknown

References: Hall 1981: 57-58; Lincoln 1923: 172; Tingley 1992, 1998: 42.

Horse Canyon Mine

Location: Nye County, USGS Dry Canyon, Toms Canyon

Minerals: mercury

Discovery: 1937

Production History: The only production in the district took place between 1937 and 1944. During this period, small retorts operated, along with a 20-ton furnace built in 1942. It may be part of the Jett District.

Total Yield: unknown

References: Bailey and Phoenix 1944: 155-156.

Twin River District

Location: Nye County, USGS Tierney Creek, South Toiyabe Peak, Carvers NW, Arc Dome

Minerals: Silver, gold, lead, zinc, tungsten, antimony, molybdenum

Discovery: 1863

Production History: The earliest production started in 1864 at the Murphy Mine and lasted until 1868. During this time, a 20-stamp mill operated in 1867 and 1868. A revival took place in 1918 and lasted until the 1920s.

Total Yield: \$750,000 between 1864 and 1868.

References: Angel 1881: 526; Kral 1951: 184; Lincoln 1923: 194; Tingley 1992, 1998: 74.

Millett (North Twin River) District

Location: Nye County, USGS Tierney Creek, Millett Ranch, Carver NW, Brewer Canyon, KIngston

Minerals: Silver, gold, lead, copper, zinc, tungsten, barite

Discovery: organized in 1863 as the North Twin River and Blue Spring districts; the name Millett was used after about 1912.

Production History: Most production took place between 1906 and 1916. Miners established the town of Millett in 1906, which survived until 1930. Most of the production came from the Buckeye mine, and a 5-stamp mill operated between 1911 and 1913.

Total Yield: unknown

References: Hall 1981: 73-74; Lincoln 1923: 177-78; Tingley 1992, 1998: 49.

Shoshone Mountains

Union District

Location: Nye County, USGS Grantsville, Ione, Corral Wash

Minerals: silver, mercury (1907-1920), gold, lead, zinc, copper, antimony, tungsten, fluorspar

Discovery: 1863, mercury discovered in 1907

Production History: The earliest production took place between 1863 and 1867. During this period, miners established the towns of Ione and Grantsville and constructed two 20-stamp mills in 1864 at Ione. Ione reached a population size of 600 in 1864 and was the county seat between 1864 and 1867. Production ended in 1867, followed by several revivals. The first revival took place in 1870, tied to the construction of a mill at Ellsworth in the Mammoth district. Another occurred in 1877, when a 20-stamp mill was built at Grantsville and enlarged to 40 stamps in 1880. Grantsville reached a population size of 1,000 during the period. Production declined in the 1890s. The third revival took place between 1898 and 1907, during which time a 30-stamp mill was built at the Berlin Mine and the town of Berlin grew up, reaching a population size of 300. Another revival began in 1909 and continued intermittently until about 1957. Ione returned to life during the period and had a post office between 1914 and 1959. Most of the mining activity took place in the Grantsville area, and 50-ton flotation mills were constructed there in the late 1920s and in the late 1930s. In 1912, a 40-ton cyanide mill was built to reprocess the old mill tailings at Berlin. Mercury production began in the district after the discovery of cinnabar in 1907. Scott furnaces were constructed in 1910 and 1913.

Total Yield: \$3,304,328

References: Angel 1881: 523; Hall 1981: 20-21, 46-49, 53-54; Lincoln 1923: 196;

Koschmann and Bergendahl 1968: 195; Tingley 1992, 1998: 74.

Cloverdale District

Location: Nye County, USGS Cloverdale Ranch, Secret Basin, Farrington Canyon, Mount Ardivay

Minerals: silver, gold, lead, copper, fluorspar

Discovery: 1905

Production History: The earliest production took place between 1905 and 1919. During this time, miners established the town of Golden, which reached a population size of 50 people and which lasted from 1906 until 1913. The Webb Mine produced sporadically from the 1910s until the early 1940s. Several features of the mine remain relatively intact, including the main adit, ore car tracks, and mill.

Total Yield: unknown

References: Lincoln 1923: 165; Mires 1997 (KEC report); Tingley 1992, 1998: 22.

AUSTIN RANGER DISTRICT

Shoshone Mountains

Jackson (Gold Park) District

Location: Lander and Nye Counties, USGS Gold Peak, South Shoshone Peak, Barrett Canyon

Minerals: Gold, silver, lead, copper, uranium

Discovery: 1864, reorganized as Jackson district in 1878, key discoveries in 1880

Production History: Most production in the Jackson district took place between 1880 and 1921. During this time, miners built a stamp mill in 1893 and a 50-ton amalgamation and concentration mill in 1921. Most of the production came from the San Francisco Mine, the Arctic Mine, and the North Star Mine.

Total Yield: \$1,000,000

References: Hall 1981: 54-55; Kral 1951: 77; Lincoln 1923: 170-71; Tingley 1992, 1998: 41.

Monitor Range

Dobbin Summit District

Location: Nye County, USGS Dobbin Summit, Stargo Creek

Minerals: silver, gold

Discovery: unknown

Production History: unknown

Total Yield: unknown

References: Tingley 1992, 1998: 27.

Toiyabe Range

Washington District

Location: Nye County, USGS Brewer Canyon, Millett Ranch, Tierney Creek, Reese River Butte

Minerals: Silver, lead, zinc, antimony, tungsten, arsenic

Discovery: 1860, organized 1863

Production History: The earliest production took place between 1863 and 1865, during which time a 10-stamp mill was built. Production declined in 1865, followed by a short revival between 1870 and 1872. After several years of decline, the district revived again between 1918 and 1922, when mining companies constructed a cyanide plant and an aerial tramway. The latest production took place in the 1930s, lasting until 1937.

Total Yield: unknown

References: Hall 1981: 140; Kral 1951: 207; Lincoln 1923: 197; Tingley 1992, 1998: 76.

Kingston District

Location: Lander County, USGS Kingston, Brewer Canyon, Bunker Hill, North Toiyabe Peak

Minerals: gold, silver, copper, lead

Discovery: discovered and organized in 1863

Production History: The earliest production took place between 1864 and 1870. During this period, the town of Kingston reached a population size of 125 by 1866. Mining companies built the 20-stamp Sterling Mill in 1865, and three other mills operated in the district by 1866. Production ended in 1870, followed by two revivals. The first revival took place between 1881 and 1886. Another revival lasted from 1906 to 1911, during which a 60-ton stamp mill was built in 1909.

Total Yield: unknown

References: Hall 1994: 95-96; Lincoln 1923: 112-113; Tingley 1992, 1998: 43.

Birch Creek (Smoky Valley, Big Smoky) District

Location: Lander County, USGS North Toiyabe Peak, Austin, Birch Creek Ranch, Simpson Park Canyon

Minerals: Gold, tungsten, uranium, silver, lead, copper, molybdenum

Discovery: 1863; however, Tingley (1998: 15) says 1865

Production History: The earliest production in the district took place between 1863 and 1868. During the time period, the town of Geneva reached a population of 500 in 1864, and a 4-stamp mill and a 20-stamp mill operated in the district. Production ended in 1867, followed by a revival in 1916 that lasted until 1921.

Total Yield: \$100,000

References: Angel 1881: 472-473; Hall 1994: 76-77, 86-87; Lincoln 1923: 109-110; Stager 1977: 72; Tingley 1992, 1998: 15.

Big Creek (Canyon City) District

Location: Lander County, USGS Bunker Hill, North Toiyabe Peak, Austin, West of Austin

Minerals: Antimony, gold, silver, barite

Discovery: 1863

Production History: The earliest production took place between 1863 and 1867. During this period, the town of Canyon City reached a population size of 1,600 and six mills operated, along with several experimental furnaces. Production ended in 1867, followed by three revivals. The first revival took place in 1890 after the discovery of antimony and lasted until 1898. Another revival lasted between 1907 and 1922. The last revival took place between 1937 and 1958.

Total Yield: \$500,000 from the first period of production, unknown later

References: Hall 1994: 72-74; Lincoln 1923: 109; Stager 1977: 71; Tingley 1992, 1998: 15.

Reese River District

Location: Lander County, USGS Austin, Yankee Blade, Barton Spring, Simpson Peak Canyon

Minerals: Silver, gold, lead, copper, zinc, uranium, Molybdenum, antimony

Discovery: 1862 and organized the same year

Production History: The earliest peak of production took place between 1862 and the late 1880s. Since then, the district continued to produce on a smaller scale with periodic cycles of higher and lower activity. Austin reached a maximum population size of 6,000 in 1864, falling to 1,700 by 1880 and continuing to decline throughout the twentieth century.

Total Yield: \$50-65 million

References: Abbe 1985; Angel 1881: 465-469; Hall 1994: 50-63; Lincoln 1923: 114-117; Tingley 1992, 1998: 60.

Toquima Range

Northumberland District

Location: Nye County, USGS Northumberland Pass, Wild Cat Peak, Jet Spring, Dianas Punch Bowl, Box Spring, Wild Cat Canyon, Petes Summit, The Monitor

Minerals: Gold, barite, silver, zinc, uranium

Discovery: 1866 and organized the same year

Production History: The earliest production took place from 1866 to 1870, during which time a 10-stamp mill was built. Four revivals occurred after the first decline in 1870. The first took place between 1875 and 1881. Miners established the town of Northumberland, which reached a peak size of around 50 during the period, and constructed a new 10-stamp mill. Another short revival occurred in 1885 and 1886. The district revived again in the period between 1908 and 1917, during which time mining companies built a 100-ton cyanide plant. Finally, the last revival took place between 1939 and 1942.

Total Yield: \$459,066

References: Angel 1881: 522; Hall 1981: 77-78; Lincoln 1923: 178; Kral 1951: 135 1977: 72; Tingley 1992, 1998: 53.

Paradise Range

Ellsworth (Lodi, Mammoth) District

Location: Nye County, USGS Ellsworth, Ione NW, Burnt Cabin Summit, Midas Spring

Minerals: tungsten, silver, lead, gold, copper, zinc, iron

Discovery: 1863. Organized as Mammoth district in 1863. Reorganized as Lodi district in 1875 after new discoveries in the western part of the district in 1874

Production History: The earliest production took place during a few years after 1863.

During this time, miners established the town of Ellsworth and built a 10-stamp mill in 1871. After the 1874 discovery, the district revived and continued production until 1880.

The town of Lodi reached a peak size of 100 in 1878, and the Illinois Mine produced about \$400,000 of ore by 1880, when it closed. Another revival took place in 1905,

following new discoveries, and continued until 1928. The town of Lodi Tanks grew up early in this time period and continued until 1917. Mining companies built a smelter in 1908, a 30-ton cyanide plant in 1916, and an experimental concentrator in 1919.

Total Yield: \$809,905

References: Angel 1881: 523, 525; Hall 1981: 64-66; Lincoln 1923: 174; Kral 1951: 93; Tingley 1992, 1998: 30-31.

Gabbs District

Location: Nye County, USGS Ellsworth, Gabbs, Paradise Peak

Minerals: magnesite, brucite, iron, silver, lead, zinc, tungsten, copper

Discovery: 1876.

Total Yield: unknown

References: Tingley 1992, 1998: 33.

Fairplay District

Location: Nye County, USGS Gabbs, Paradise Peak

Minerals: gold, silver, mercury, copper, tungsten

Discovery: 1865; the area includes the old Atwood district, which was discovered in 1901, and the Goldyke district, discovered in 1906.

Total Yield: unknown

References: Tingley 1992, 1998: 31.

Paradise Peak District

Location: Nye County, USGS Paradise Peak

Minerals: mercury, tungsten, molybdenum, copper, gold, silver

Discovery: 1865 and organized the same year.

Total Yield: unknown

References: Tingley 1992, 1998: 55.

ELY RANGER DISTRICT-WEST HALF

Egan Range

Ward District

Location: White Pine County, USGS Ely, Ward Mountain, Ward Charcoal Ovens

Minerals: Silver, lead, zinc, copper, gold

Discovery: 1872

Production History: The earliest production took place between 1872 and 1885, much of which came from the Paymaster Mine and the Pleiades Mine. During the period, the town

of Ward grew up, reaching a population of 2,000 in 1877. In 1876, a 20-stamp mill was moved from Troy, and two smelters operated the same year. Production ended in 1885, followed by three revivals. The first revival lasted from 1906 until 1920. Another short revival took place in the 1930s and yet another in the 1960s.

Total Yield: \$7,000,000

References: Angel 1881: 663-4; Lincoln 1923: 256-257; Hall 1994: 205-207; Tingley 1992, 1998: 76.

White Pine Range

White Pine District

Location: White Pine County, USGS Treasure Hill, Seligman Canyon, Mt. Hamilton, Hamilton, Green Springs

Minerals: Silver, gold, lead, copper, tungsten, zinc, molybdenum, tin

Discovery: 1865

Production History: The earliest production took place at Monte Cristo in the western section of the district between 1865 and 1872. Miners established the town of Monte Cristo, which reached a population size of 150 during the period, and built a 5-stamp mill. The mill operators added another five stamps in 1869, two Stetefeldt furnaces in 1870, and another 10 stamps in 1871. Production in the district shifted eastward to Treasure Hill in 1868 after a fabulous silver strike there, followed by the emergence of the large towns of Hamilton, Treasure City, and Shermantown, along with several small camps such as Eberhardt. At one point, 200 mines and 23 mills operated on Treasure Hill. The Treasure Hill mines, however, soon failed, and most closed down in the early 1870s. Production on a smaller scale continued at a few mines, most notably the Eberhardt, until the early 1890s. Another discovery at Seligman in the western section of the district in 1886 shifted the focus of production there for a few years. Production rapidly declined within a couple of years and ended in 1905. The district revived for awhile in the early 1920s, when small-scale mining and cyanide reprocessing of old mill tailings took place. Both Treasure Hill and the Monte Cristo area have been mined in the late twentieth century as well.

Total Yield: \$22 million

References: Angel 1881: 650-1, 659ff; Hall 1994: 149-153, 165-166, 186-188, 199-202; Lincoln 1923: 257-259; Tingley 1992, 1998: 78.

Currant District

Location: Nye County, USGS Currant Summit, White Pine Peak, Douglas, Badger Hole Springs, Current Mountain, Horse Track Spring

Minerals: Gold, lead, copper, tungsten, manganese, uranium, fluorspar (oil shale, petroleum)

Discovery: 1914

Production History: Farmers established the settlement of Currant in 1883. The earliest mining production took place between 1914 and 1916. Another production period took place between 1939 and 1942, when manganese was mined.

Total Yield: unknown

References: Hall 1981: 32-22; Lincoln 1923: 166; Tingley 1992, 1998: 25.

Grant Range

Troy District

Location: Nye County, USGS Troy Canyon, Bull Whacker Spring, Heath Canyon

Minerals: tungsten, gold, lead, zinc, silver, copper, uranium, beryllium

Discovery: 1867; Tingley (1998: 73) says 1869.

Production History: The earliest production in the district took place between 1867 and 1876. English mill with 20 stamps constructed in 1870. The town of Troy reached a population of 100 or more in 1871. Production ended in 1876, followed by two revivals. The first revival occurred between 1908 and 1915. Another revival lasted from 1936 to 1949, during which time a flotation mill was built.

Total Yield: unknown

References: Angel 1881: 526-7; Hall 1981: 129-131; Lincoln 1923: 193-4; Tingley 1992, 1998: 73.

Sharp District

Location: Nye County, USGS Adoven, Wadsworth Ranch

Minerals: silver, lead

Discovery: 1918

Production History: unknown.

Total Yield: unknown

References: Tingley 1992, 1998: 65.

Quinn Canyon Range

Willow Creek District

Location: Nye County, USGS Nyala

Minerals: gold, silver, lead

Discovery: 1911

Production History: The earliest production in the district took place between 1911 and 1914, during which time miners built a 25-ton mill. Production ended in 1914, followed by two revivals. The first revival lasted from 1917 to 1922, when a 5-stamp amalgamation mill was constructed. Another short revival took place between 1927 and 1928.

Total Yield: \$50,000-100,000

References: Hall 1981: 143-144; Tingley 1992, 1998: 79.

Quinn Canyon

Location: Nye County, USGS Badger Gulch, Nyala, McCutcheon Spring, Goat Ranch Spring, Quinn Canyon, Adoven, Wadsworth Ranch

Minerals: fluorspar, beryllium, tungsten

Discovery: 1934

Production History: unknown

Total Yield: unknown

References: Tingley 1992, 1998: 58.

ELY RANGER DISTRICT-EAST HALFSchell Creek RangeSeigel (Centerville, Queen Springs) District

Location: White Pine County, USGS Silver Canyon, Stone House, Schellbourne, Mattier Creek

Mineral: Silver, lead, manganese, zinc, gold, tungsten, arsenic

Discovery: 1870, organized in 1872

Production History: The earliest production in the district took place between 1871 and 1874. During this period, the town of Centerville reached a maximum population size of 75 in 1872. Miners built a 20-stamp mill in 1872. Production ended in 1874, followed by two revivals. The first revival took place in 1881, when a 5-stamp mill was constructed, but didn't last the year. Another revival occurred in 1903 and lasted until 1908. The camp of Centerville was renamed Siegel during this time.

Total Yield: unknown

References: Angel 1881: 655-6; Lincoln 1923: 241; Hall 1994: 189-190; Tingley 1992, 1998: 65.

Silver Canyon (Aurum) District

Location: White Pine County, USGS Silver Canyon, Mattier Creek

Minerals: lead, silver, copper, gold

Discovery: 1869; however, Tingley (1998: 66) says that the district was discovered in 1879 and organized in 1880.

Production History: The earliest production in the district took place between 1869 and 1873. During this period, the town of Silver Canyon reached a population size of 50 people in 1872. Production ended in 1873, followed by three revivals. The first revival began in 1878 and lasted until 1884. Miners constructed a 10-stamp mill at the mouth of Silver Canyon in 1881, transporting ore with a tramway from the Blue Bell mine. The town of Aurum was established during this period and reached a population size of about 50 by 1881. Another revival began in 1887 and lasted until 1906. In 1888, the town of Aurum again reached a size of 50 people. The last revival took place between 1914 and 1920, shortly after which the last residents left Aurum.

Total Yield: unknown

References: Angel 1881: 655-6, 663; Lincoln 1923: 241; Hall 1994: 120-122; Tingley 1992, 1998: 66.

Ruby Hill District

Location: White Pine County, USGS Silver Canyon, Mattier Creek

Minerals: Silver

Discovery: 1871 and organized in 1872

Production History: The earliest production took place between 1871 and 1873. During this period, the town of Ruby Hill reached a peak population of 150, and mining companies built two 5-stamp mills in 1872. Production ended in 1873, followed by three revivals. The first revival took place in the early 1880s. Another lasted from 1892 to 1895. The last revival took place between 1923 and 1928.

Total Yield: \$200,000

References: Angel 1881: 655-6; Hall 1994: 179-180; Lincoln 1923: 241; Tingley 1992, 1998: 62.

Muncy Creek District

Location: White Pine County, USGS Kalamazoo Creek, Silver Canyon

Minerals: zinc, copper, lead, silver, tungsten

Discovery: early 1860s; however, Tingley (1998: 52) says 1871

Production History: The earliest production took place in the early 1860s but not until 1872 did the district enter into a major period of production. Twenty people lived at the town of Muncy Creek in the 1870s. Ore appears to have been shipped out of the district to smelters at Salt Lake. Production ended in the late 1890s, followed by three revivals. The first revival took place from 1908 to 1912. Another lasted from 1919 to 1923, during which time a mining company constructed a 25-ton mill and calcinating plant at the Grand Deposit mine in 1920. The last revival took place in 1937.

Total Yield: unknown

References: Angel 1881: 655-6, 663; Lincoln 1923: 241; Hall 1994: 168-9; Tingley 1992, 1998: 52.

Piermont District

Location: White Pine County, USGS North Schell Peak, South Schell Peak

Minerals: Silver, gold, copper, lead

Discovery: 1869

Production History: The earliest production lasted from 1870 to 1873. Mining companies employed 30 people at the Piermont Mine and constructed a 10-stamp mill in 1871.

Production ended in 1873, followed by a major revival between 1920 and 1936. During this period, the Cocomongo mill from Egan Canyon was moved here in 1922, mining companies built a diesel electric plant and mill plus a 10,800 feet long waterline in 1924 and employed more than 100 men, and electric locomotives hauled ore from mine to mill.

Production: \$2,500,000 (only \$20,000 before 1920)

References: Angel 1881: 655; Lincoln 1923: 253-4; Hall 1994: 173-175; Tingley 1992, 1998: 56.

Duck Creek District

Location: White Pine County, USGS Duck Creek Valley, Cleve Creek Baldy, Cave Creek

Minerals: Lead, silver, copper, zinc, gold, limestone, clay

Discovery: 1869

Production History: Duck Creek was a farming settlement established in the late 1860s.

Most mining production in the district took place between 1905 and 1921.

Total Yield: \$164,015

References: Hall 1994: 137-138; Lincoln 1923: 244-5; Tingley 1992, 1998: 28.

Cleve Creek District

Location: White Pine County, USGS Cleve Creek, South Schell Peak, Cave Creek, Cave Mountain

Minerals: tungsten, gold, silver

Discovery: 1923

Production History: The earliest production took place between 1923 and 1926. During this time, a camp of 15 people grew up and a 4-ton amalgamation and concentration mill built in 1923 processed ore from the Kolcheck Mine. Production ended in 1926 after a yield of about \$15,000. A revival took place in 1951 that lasted until 1956.

Total Yield: \$15,000+

References: Hall 1994: 134; Tingley 1992, 1998: 22.

Nevada District

Location: White Pine County, USGS Cave Creek, Comins Lake

Minerals: manganese, silver, gold, lead, copper

Discovery: 1869

Production History: unknown.

Total Yield: unknown

References: Tingley 1992, 1998: 52.

Taylor District

Location: White Pine County, USGS Conners Pass, Majors Place

Minerals: Silver, lead, antimony, copper, zinc, gold, arsenic

Discovery: 1873

Production History: The earliest production took place in the early 1870s, but most of the yield came from the time period between 1880 and 1889. Miners established the town of Taylor, which reached a population of 1,500 by 1883 and was mostly abandoned by 1890. The Argus Mine and the Monitor Mine were the largest producers. In 1881. In 1881 a 10-stamp mill with a Knight water wheel was built near Steptoe Creek, and a 15-stamp mill on Willow Creek was built in 1883. Production mostly ended in 1889, when the Monitor Mill closed. The district revived in 1918 and has continued to produce off

and on since then. Miners built a 100-ton cyanide plant built at the Argus mine in 1919. Another mill was built near the Enterprise Mine in 1939 and was modified in 1951. In 1980, the Silver King Mines, Inc., began large scale open pit mining in the district.

Total Yield: unknown

References: Angel 1881: 657; Lincoln 1923: 255-6; Hall 1994: 195-197; Tingley 1992, 1998: 71.

Cooper District

Location: White Pine County, USGS Majors Place

Minerals: lead, silver, fluorspar

Discovery: 1869

Production History: unknown

Total Yield: unknown

References: Tingley 1992, 1998: 23.

Snake Range

Mount Moriah District

Location: White Pine County, USGS Mount Moriah, Six Mile Canyon, Little Horse Canyon, The Cove, Old Mans Canyon, Sacramento Pass

Minerals: lead, zinc, garnet, silver, copper, tungsten

Discovery: 1870 (1905?)

Production History: unknown

Total Yield: unknown

References: Tingley 1992, 1998: 51.

Black Horse District

Location: White Pine County, USGS Sacramento Pass, Old Mans Canyon

Minerals: Gold, silver, lead, tungsten, copper, zinc

Discovery: 1870, 1905

Production History: The earliest production took place from 1906 to 1913. During this time period, miners established the town of Black Horse, which reached a population of 400 early in 1906. An arrastra operated in 1908, and the owners of the San Pedro Mine built a 20-stamp mill in 1909. Production ended in 1913 after yielding nearly \$1 millions in ore, most from the first year or two of the period. A revival took place in 1933 and lasted until 1954. In 1943, miners built a 25-ton cyanide plant to process tungsten ore from the Gold King Mine.

Total Yield: ca. \$1 million

References: Angel 1881: 663-4; Hall 1994: 122-123; Lincoln 1923: 242; Tingley 1992, 1998: 15.

Osceola District

Location: White Pine County, USGS Windy Peak

Minerals: Placer gold, gold, silver, lead, zinc, copper, tungsten, phosphate

Discovery: 1872, placer gold discovered in 1877

Production History: The earliest hardrock production took place in the early 1870s, but large-scale placer mining began in 1877 and lasted until 1900. During this period, the town of Osceola grew up and reached a population size of several hundred in the 1870s and 1880s. Mining companies worked the placer deposits with hydraulic machinery after the completion of an extensive water conveyance system. Several hardrock mines operated in addition to the more productive placer operation. The Gilded Age Mine operated a 5-stamp mill in 1878, three stamp mills operated in Old Mill Gulch in the 1880s, and the Osceola Mining Company built a 20-stamp mill in 1883. Production ended in 1900 with the exhaustion of placer deposits and failure of the water conveyance system. The district experienced a revival in 1925, which lasted until 1932. Leasing operations continued in the district until the late 1950s.

Total Yield: \$3.3 million

References: Angel 1881: 662; Hall 1994: 170-173; Lincoln 1923: 253; Tingley 1992, 1998: 54.

Tungsten (Lincoln, Hub) District

Location: White Pine County, USGS Wheeler Peak, Windy Peak, Minerva Canyon

Minerals: Tungsten, Silver

Discovery: 1899, organized in 1900

Production History: Very little production took place until 1910, when the U.S. Tungsten Corporation built a 50-ton concentrating mill and a town of 50 people grew up. The mill closed in 1911 but reopened in 1915 and included a 6,000 feet long water ditch from Williams Creek. Production ended in 1917.

Total Yield: \$704,000

References: Angel 1881: 654; Lincoln 1923: 256; Hall 1994: 202; Tingley 1992, 1998: 73.

Snake (Bonita) District

Location: White Pine County, USGS Kious Spring, Wheeler Peak, Garrison

Minerals: Tungsten, lead, copper, silver

Discovery: 1869

Production History: The only production in the district took place between 1913 and 1920. In 1913, a two-ton experimental mill was constructed to treat the tungsten ore extracted from the Tilford Mine. Bonita reached a population size of 25 shortly thereafter. The Uvada Tungsten Company built a 20-stamp mill in 1918. Production ended in 1920.

Total Yield: \$10,000

References: Angel 1881: 657; Hall 1994: 124; Lincoln 1923: 255; Tingley 1992, 1998: 68.

Lexington District

Location: White Pine County, USGS Arch Canyon, Kious Spring, Wheeler Peak, Minerva Canyon

Minerals: tungsten, gold

Discovery: 1870; however, Tingley (1998: 45) says the discovery was 1883; tungsten was discovered in 1917

Production History: The earliest production took place between 1870 and 1872 after the discovery of silver ore. After production ended, no more work took place in the district until 1917, when tungsten was discovered at the Bonanza Mine and a small mill was constructed. Production ended in 1918. Another revival took place in 1941. The Bonanza Mine was reopened and a 50-ton concentrating mill built. Production ended in 1942.

Total Yield: \$80,000-100,000

References: Hall 1994: 159-160; Lincoln 1923: 251, 254-255; Tingley 1992, 1998: 45.

Shoshone District

Location: White Pine County, USGS Minerva Canyon

Minerals: Tungsten, lead, silver, gold

Discovery: 1869

Production History: The earliest production took place at the Indian Queen Mine in Swallow Canyon from the 1870s to the 1890s. Miners established the town of Shoshone in the 1880s and a few people continued to live there in the 1990s. Prospectors discovered tungsten in the district in 1915 at the Minerva Mine about two miles away from Swallow Canyon. The Minerva Tungsten Corporation built a 150-ton concentrating mill in 1918. Production continued intermittently until the late 1950s.

Total Yield: unknown

References: Angel 1881: 657; Lincoln 1923: 254-5; Hall 1994: 188-189; Tingley 1992, 1998: 66.

¹ symbol codes: Ag=silver, Au=gold, Pb=lead, Zn=zinc, Cu=copper, Sb=antimony, W=tungsten, Hg=mercury